INTEGRATED BILINGUAL GRAMMATICAL ARCHITECTURE:

INSIGHTS FROM SYNTACTIC DEVELOPMENT

by

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Abstract

It is generally agreed upon today that bilingual children are able to differentiate their two languages as early as the babbling stage, but that *the child* is able to make such a distinction does not entail that the *grammar* does in the same categorical way. This dissertation argues that bilingual grammar is INTEGRATED rather than ISOLATED, on the basis of evidence of cross-linguistic influences in syntactic development: positive cross-linguistic influence, or 'facilitation', is captured within the same system as negative cross-linguistic influence, or 'interference'. In analyzing the phenomena in Optimality Theory—a framework of universal, violable grammatical constraints—I show how an integrated bilingual grammatical architecture can explain those phenomena, which reflect a variety of structural representations, as arising from a grammar that does not fundamentally differ from a monolingual one. The empirical focus of the dissertation is on Spanish-English bilingual data from two experiments and from corpora of spontaneous speech, on the basis of which three main types of constructions are studied: predicative sentences involving BE verbs, *wh*-questions, and noun modification. Taking the traditional characterization of an Optimality-Theoretic grammar as a point of departure, each analyzed construction poses a new challenge to the architecture. The notions of 'language tags' within the propositional representation of an individual utterance and 'split-and-tagged constraints' that utilize those propositions' tags in evaluating their own applicability are introduced in response to those challenges, as is a novel account of the cross-linguistic influences that can be elicited in real time. Implications for the architecture of the bilingual adult grammar are also discussed.

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Learning languages would seem to have been the goal of my undergraduate training, but upon diving into teaching one myself I realized how little I knew about the process and how much there was to learn. I thought back to Héctor Campos and Dominik Rus and Jeff Connor-Linton and grasped that I could *study* that process and contribute to the body of *knowledge about learning*, and I was all-in on graduate school. Lucky for me I turned up at Johns Hopkins on a drizzly December day in 2008 and screwed up the courage to approach Geraldine Legendre, who invited me back to her office for the first of many, many rousing conversations about language. This dissertation is a fitting culmination of our years of work together, and I hope on these few pages I succeed in conveying my gratitude for the myriad contributions that she and others have made to my training and research in the last half-decade.

Geraldine was willing to take a chance on me despite my decidedly non-scientific background, but from my first day in the department she never let me know it—expectations for me were just as high as for anyone, and her (usually quiet) confidence in my promise as a researcher motivated me to push toward excellent work at all times, not only in diverse research methods but in leadership of the lab. I appreciate her patience as I learned to write less like a poet and more like a scientist, as I learned to argue less like a student and more like a colleague—and as I pursued a line of research that was decidedly distinct from many of her interests. Geraldine's is a quick and cutting mind that has informed my work tremendously, but what I most value about her mentorship is how absolute her trust in me has been: she is humble before ideas, candid about concerns, and magnanimous in intellect and in faith, and for such a person always to believe in me has been truly edifying.

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Contents

List of Tables

List of Figures

List of Abbreviatons

Adj .... adjective
Asp (or Asp^0) .... aspectual head
AspP .... aspectual phrase
AGR .... agreement
AUX .... auxiliary
C (or C^0) .... complementizer head
CP .... complementizer phrase
D (or D^0) .... determiner head
DP .... determiner phrase
e .... empty category
EN .... English
EPP .... Extended Projection Principle
FUT .... future tense
IL .... individual-level
INF .... infinitive (non-finite)
M .... mean/average
MLU .... Mean Length Of Utterance
N .... noun
NRF .... non-finite root form
OI .... optional infinitive

OT	Optimality Theory/Optimality-Theoretic
PLU	Predominant Length Of Utterance
PRES	present tense
PST	past tense
SC	small clause
SD	standard deviation
SE	standard error
Spec	specifier
SL	stage-level
SP	Spanish
TAC	Temporal Anchoring Constraint
T (or T^0)	tense head
TP	tense phrase
UCC	Unique Checking Constraint
V (or V^0)	verb head
VP	verb phrase
XP	phrase (generic)
(X)	omission of constituent X (in examples)
*X	ungrammatical utterance X
***(X)**	ungrammatical omission of constituent X
?X	questionably grammatical utterance X
1p, 2p, 3p	first-, second-, third-person plural
1s, 2s, 3s	first-, second-, third-person singular
☞	optimal candidate marker

Chapter 1

Bilingual development and grammatical architecture

1.1 Introduction

In modern linguistic theory, monolingualism has virtually always been the primary focus of research. Linguistic knowledge presents an imposing challenge for theorists even in the case of the acquisition of a single language, and determining how this process progresses in the face of dual-language input would seem simply to complicate matters (see, e.g., Johnson and Newport, 1989). Why, then, principally study the simultaneous acquisition of multiple languages, when a comprehensive explanation of the acquisition of only one still eludes us? This is a sensible concern, but this dissertation has as one of its aims to argue for the usefulness of a focus on bilingualism as a way to see differently and fruitfully into the language faculty. Noam Chomsky, the father of the tradition in which monolingualism has been the primary subject of research, tends to address the 'ideal speaker-hearer' in theoretical work (Chomsky, 1969). This 'ideal speaker-hearer' has an absolutely set representation of her native language, lives in a homogenous linguistic environment, and has unlimited processing resources (e.g., would never 'forget' the beginning of a long sentence upon arriving at its end).

Focusing on this sort of a user of language has the benefit of allowing one to overlook all those messy complications that can arise when considering a person living and using language in what is naturally an ever-changing environment. But that same abstraction from circumstance can also weaken a theory's applicability and its effectiveness at explaining the phenomenon in question, that is in explaining linguistic knowledge and real-time usage. This is so because, of course, children acquiring language, and even adults fully proficient in it, *do* use it differently according to context, *do* travel to environments where the surrounding language is somewhat or very different from the one they speak, and *do* have processing limitations. So while the goal of an adequately formal theory might seem to compel this kind of abstraction, we should acknowledge—as does Chomsky, to his credit—that such abstraction comes at a price, namely the price of rejiggering the details of the abstraction to accommodate, e.g., variation or learning problems, which a peek out from behind the curtain might show the tools for solving in an empirical, ecologically responsible way.

This project identifies and proposes an explanation for some 'unique' aspects of bilingual (morpho)syntactic development and use. A significant amount of research has already been carried out in this vein, of course, and recent review articles have highlighted some of the main points of agreement (e.g., Serratrice, 2013). Here I develop a formal account of bilingual grammar that incorporates new insights from a variety of sources, discussing what it means for the computational system so clearly adapted to acquire a language to be able to develop two almost as easily. The dissertation is organized as follows. In this introductory chapter I review the preexisting literature on cross-linguistic influences, focusing on acquisition but not exclusively so, and pointing out areas of disagreement or unclarity to which this project will suggest some solutions. Beyond this I present data and arguments for the thesis of integrated bilingual grammar, primarily couched in Optimality-Theoretic terms. The integration hypothesis assumes that (within some limits, to be discussed throughout) a bilingual's two languages emerge as the product of one single grammar; this dissertation formalizes that hypothesis to show the feasibility of the proposal and to extract novel predictions. The project is organized into a series of empirical investigations focused on syntactic development in Spanish-English bilingual children, as outlined in Table 1.1. Two chapters focus on FACILITATION—the phenomenon of bilingual bootstrapping in which knowledge acquired for use in one language speeds up, or *facilitates*, the acquisition of a related construction in the other language. The other chapter focuses on INTERFERENCE—the reverse phenomenon, in which knowledge developed in response to exposure to one language hinders, or *interferes with*, the development of related but distinct regularities in the other language.

Ch.	Phenomenon	Construction	Examples	Projection
2	Facilitation	Copulas	‘Carol is intelligent’ ‘The water is warm’	*Tense phrase* ‘TP’
		Tense marking	‘Sergio eats spinach’	TP
3	Facilitation	*Wh*-questions	‘Why is Ines dancing?’ ‘What does Ana study?’	*Complementizer phrase* ‘CP’
4	Interference	*Wh*-questions	*‘Why Ines is dancing? *‘What ∅ Ana study?’	CP
		Noun modification	‘The green car’ *‘The car green’	*Determiner phrase* ‘DP’

Table 1.1: Outline of principal phenomena, constructions, and projections addressed

In all three chapters I will show that while bilingual children do produce errors, they generally produce them either at significantly lower rates than monolinguals, or of different forms than monolinguals—both outcomes that are more compatible with an integrated rather than an isolated grammar. In the concluding chapter I point to several questions raised by the project that should be addressed in future research.

1.2 Bilingualism in development and maintenance

The earliest contributions to the study of bilingualism within the framework of generative grammar tended to tout a ‘fused’ or ‘unified development’ hypothesis (Volterra and Taeschner, 1978; Taeschner, 1983). Variations on this hypothesis assumed that bilinguals' language begins as a blend of the grammars of the languages to which they are exposed; from this it would follow that only slowly do children come to differentiate those two languages completely. Since it had long been established that children make use of *code-mixing* (the use of lexical items from both languages in a single utterance), it was originally hypothesized that a mixed code in their linguistic *competence* caused code-mixing in production. Mixed utterances, containing lexical items from each of the two systems, had suggested to investigators that the languages themselves were not separated and instead represented a FUSED GRAMMAR.

However, Meisel (1989; 1990) observed that the children studied only seemed to mix *lexical* items and showed little cross-linguistic influence in the domain of syntax, and with this, a separate language or ISOLATION HYPOTHESIS began to predominate in the field. While at the end of the 1980s the focus remained on whether bilingual children possessed one linguistic system or two (e.g., Genesee, 1989), subsequent work on bilingual acquisition has suggested that the more likely scenario is one in which each language occupies its own place in the child's linguistic competence (e.g., Grosjean, 1992; Nicoladis, 2006; Cantone, 2007). This position represents a counterpoint to the previously dominant view held by researchers working on bilingual first language acquisition. Evidence of a *fused* system that contains interchangeable lexical items is now typically understood in the light of children's contextual sensitivity when choosing what words to use, depending on the parent's conversational strategy and the demands placed on the child regarding which language she may use (Lanza, 1992). Grosjean (1989) presaged this position in cautioning that bilinguals should not be viewed as two monolinguals in one person but rather as instances of unique, interactive individual speakers capable of entering different 'language modes'.

On the basis of these studies and others, it has become accepted that each language acquired by a bilingual is instantiated as its own system, embodying what I will call the isolation hypothesis; crucially, however, this does not preclude the possibility of cross-linguistic transfer (or influence or interference, as it has been variously called in the literature). In this project I use these terms contrastively: 'influence' as a neutral term, capable of encompassing both accelerating and delaying cross-linguistic effects; 'interference' denotes a delaying effect only; and 'facilitation' denotes an accelerating effect only. That hypothesis is to be contrasted with the fusion account, along the lines of Volterra and Taeschner's (1978) aforementioned contribution, in which the grammatical knowledge pertaining to each language is stored within one single system, the distinctions necessary for acceptable language use being left to lower levels of the representation (i.e., levels closer to the speech stream, such as the phonology). While Volterra and Taeschner did not formalize their fusion account, they rely on the notion of constructions, first as not being mapped to either language and later coming slowly apart, according to the the child's own realization that certain words and constructions belong to one language or the other only.

My own proposal departs from both the isolation and the fusion accounts. I argue that it is not the case that a bilingual's two languages correspond to two grammars, held apart in the mind, but that it is also not the case that syntactic rules from either language are applied indiscriminately to children's early utterances (nor that the first operative distinction between syntaxes is accessible to consciousness). My INTEGRATION HYPOTHESIS instead embodies an account in which bilingual children indeed begin with the same basic grammatical endowments (universal grammatical constraints, nuggets of conceptual knowledge) as monolingual children, and as far as they can do so—while coming to produce utterances faithful to their primary linguistic data—they maintain the very same constraints and architecture as a monolingual child does. Where the two languages diverge with respect to a particular syntactic rule, the grammar responds by duplicating, or splitting, the constraint that is not satisfied for both languages (i.e., is not ranked relative to other constraints in the same way in the two languages), making it possible to 'conserve' the generative mechanism as far as possible and to observe cross-linguistic effects throughout the lifespan. In this section I motivate the integration proposal by sketching the boundaries of cross-linguistic influence, as observed primarily in bilingual language development but also in adult bilingualism: first I review several findings of delay and interference, which have received the bulk of bilingualism researchers' attention, then move to cross-linguistic priming, the focus of many psycholinguists, and finally pivot to the central phenomenon to my dissertation, facilitation, which has largely been ignored by both communities. A brief discussion of theories of grammatical development rounds out the introduction, which gives context to the use of the chosen formalism within the project.

1.3 Negative cross-linguistic influence

Much recent research on bilingual first language acquisition has focused on the possibility and nature of negative cross-linguistic influence, either quantitative, in which case I label it 'delay', or qualitative, in which case I label it 'interference'. Numerous studies (e.g., Döpke, 1998; Döpke, 2000; Hulk and van der Linden, 1998; Müller, 1998; Müller and Patuto, 2009; Yip and Matthews, 2000) have recently found temporary but systematic evidence of such cross-linguistic influence in the domain of syntax, either in the later acquisition by bilinguals of a target pattern, relative to monolingual norms, or in the deviant productions by bilinguals that do not mirror monolinguals' errors but *do* mirror bilinguals' other-language grammar. I discuss each of these phenomena in turn.

DELAY caused by cross-linguistic influence overall seems to be constrained in the following ways: it is most likely to occur at an interface between two modules of grammar, and it requires a similarity of surface structure such that an initial conflation of forms would be feasible. Crucially to the discussion at hand, by implication cross-linguistic interference does *not* involve 'core syntax', which is presumed to develop independently per language. In what seems to be the first explanatory proposal of delay, Müller and Hulk (2001) formulate those constraints as follows:

(1) *The Interference Hypothesis*

a. Cross-linguistic interference occurs at the interface between two modules of grammar, and more particularly at the interface between pragmatics and syntax in the so-called C-domain, since this is an area which has been claimed to create problems in L1 acquisition also. (Condition A)

b. Syntactic cross-linguistic influence occurs only if language A has a syntactic construction which may seem to allow more than one syntactic analysis and, at the same time, language B contains evidence for one of these two possible analyses. In other words, there has to be a certain overlap of the two systems at the surface level. (Condition B) (Müller and Hulk)

The similarity of surface form is crucial to the analyses that fall under Müller and Hulk's proposal because while monolingual children need time, and a critical mass of exposure, to master their target languages, they have the advantage of needing to master only *one* system. But bilingual children are exposed to two languages all throughout their development, and are very unlikely to have received the same *quantity* of primary linguistic data that monolinguals do by the same age. According to the studies mentioned above, for the most part bilingual children are able to differentiate between the two languages that they are simultaneously acquiring. In the course of their acquisition, though, if the two languages contain some structures that are superficially similar, the children may confound the *generalizations* applicable to one language *into* the other. If the surface forms are similar enough, children may attribute one syntactic representation to members of an analogous class of utterances in each language—even though they are represented differently in the respective target grammars. Without surface overlap, though, this kind of structural delay seems unlikely.

1.3.1 A case of delay

A now-canonical instance of delay is the overuse of object drop by Germanic-Romance bilinguals observed by Müller and Hulk (2001). With regard to object drop, Dutch and German are only possible as sources of transfer to French and Italian, respectively, because the surface forms of utterances with dropped objects are sufficiently similar.[1] It is a question of pragmatics as to how often speakers of each language employ object drop; there are a greater number of discourse-pragmatic licensing conditions for this phenomenon in Germanic languages than in Romance languages, so it is more frequently used in the Germanic

[1] If similarity of surface form were the only condition on cross-linguistic delay, then there would be no principled reason why delay would flow from the Germanic to the Romance languages rather than from the Romance *to* the Germanic. But the other condition on delay, Condition (A), stipulates a distinction between the source of the delay and the recipient of the delay, viz. that the recipient language contains a multiply analyzable surface form for which only one analysis is supplied by the source language. This condition predicts unidirectional delay only.

languages (Jakubowicz et al., 1997). The authors provide Dutch and French examples such as those in (2) and (3).

(2) Dutch:

a. Heeft mevrouw de Wachter gemaakt (Joost 2;08;19)
[THAT] has Mrs. de W made
'Mrs. de W made that'

b. [*] Ik heef gevonden
I have [THAT] found (Hein 2;6)
'I found that'[2]

(3) a. French:

je sais *e*
I know
'I know (it/that)'

b. [*] Il mets dans le bain
he puts [HER] in the bath (Lou)

c. Jean le voit *e*
John him-CL sees
'John sees him'

The utterances above illustrate the contexts in which object drop is generally licensed and where it is prohibited in the respective languages. In Dutch (and German), object drop is licensed in many contexts, such as that seen in (2a). This example shows that object drop is licit in Germanic, but only when SpecCP is not otherwise filled, as the contrasting example in (2b) shows (in which SpecCP is filled with the subject *Ik*). The SpecCP position is reserved

[2]The French counterpart of this utterance *is* grammatical using object drop; it is one of a restricted set of constructions for which this is acceptable in contemporary spoken French, akin to the example in (3a). Parallel examples of non-target object drop, without acceptable French analogs, are found in the speech of Dutch-acquiring monolingual and bilingual children nonetheless (cf. Müller and Hulk, 2001).

for the (null) object DP—the phenomenon is sometimes termed 'topic-drop' because of the information-status of the dropped object—and this is an option frequently employed (Jakubowicz et al., 1997). In contrast, in French (and Italian), object drop without a clitic is most frequently prohibited, as in (3b). (3a) represents one of the few formulas, or idiomatic expressions, that are seen in French where object drop occurs without a replacement clitic (which the notation *e* for 'empty category' reflects); for the most part, however, a lexical object can only be dropped when it is replaced with a preverbal object clitic, as in (3c). As such, the overall distribution of object drop is more constrained in Romance than it is in Germanic languages.

But in terms of delay, such constructions in French as that in (3a) might give the child the false impression that the canonical object position is empty because of discourse-licensing just as it would be in Germanic languages. But it is *not* a discourse-pragmatic constraint that licenses object drop in French—the clitic is what licenses the empty category in the canonical object position (or, in the idiomatic cases like 3a, is what is dropped). The constraint active in the *licensing* of Germanic object-drop trickles in from that grammar to the child's Romance grammar, causing the Germanic-Romance bilingual child to drop more objects in French than a monolingual speaker would, in such contexts as that of (4):

(4) Il *(le) met dans le bain
he *(it) puts in the bathroom
'He puts it into the bathroom' (Lou)

Monolingual French-speaking children drop objects in such target-deviant ways as well, but with a much lower frequency than the bilingual children investigated by Müller and Hulk do (e.g., Jakubowicz and Rigaut, 1997, who report a French object drop rate around

11%, compared with the 36.1% average rate by bilinguals in French). And just as predicted by Condition (A) on cross-linguistic delay—namely, that it occurs while the C-domain is vulnerable—once the C-system is more robustly utilized in other contexts, such as *wh*-questions and complementizers, the frequency with which Germanic-Romance bilingual children drop objects in error in their Romance language decreases: they converge on the target regularities of each individual language.

1.3.2 The need for two conditions

To show that both of the stipulated conditions on cross-linguistic delay in (1) are necessary in order to capture what is transferable and what is not, Hulk and Müller (2000) investigate the development of a characteristic error pattern in the same children at the same age—root infinitives—as in the examples in (5) and (6). They are commonly produced in early child German (e.g., Weissenborn, 1990, (6a) below) and somewhat commonly in early child Italian (e.g., Guasti, 1994, (6b) below). In contrast, the contexts in which main clause infinitives are allowed in adult productions are severely limited, such as the exclamatives reproduced in (5).

(5) a. wie diese schliessen?! (German: Wijnen, 1997)
how these close

b. partire immediatemente! (Italian: Hulk and Müller, 2000)
leave immediately

(6) a. mein Kakao hinstellen (German: Simone 2;0;2, op. cit.)
my cacao put down

b. qua attaccare (Italian: Carlotta 2;4;21, op. cit.)
there fix

According to Hulk and Müller, Condition (A) on cross-linguistic delay is satisfied because root infinitives represent syntactically unanchored structures (Avrutin, 1997; Hoekstra and Hyams, 1998), uncommonly used by adults and more frequently employed by children. As utterances unanchored to syntax and dependent on discourse structure for their licensing, they involve the syntax-pragmatics interface. In adult speech, root infinitives are a marked phenomenon, and it is in fact unclear whether they are at all present in child-directed speech. While such unanchored structures are present in adult language only in the limited contexts of some imperatives or exclamatives, as in (5), children use them in declarative utterances as well, as in (6).

Still, the conditions that Hulk and Müller set on cross-linguistic delay predict a lack of delay because Condition (B) is not met. This is the case because there is not enough evidence in the input of either language to suggest to children that they should use root infinitives *more* often than they do; in fact, there is likely no such evidence. Given the lack of evidence in the input which would support *further* use of root infinitives, children's non-target-like use of root infinitives in declarative clauses is not reinforced by child-directed speech (CDS). Without evidence from one language that might lead the child to misconstrue the other, there should not be delay.

Even though adult root infinitives are an element of the syntax-pragmatics interface, cross-linguistic delay is not observed in bilingual children acquiring a Germanic and a Romance language because there is not enough evidence in the input that would support an incorrect analysis of these structures.[3] The 'mixed signals' that are found for object drop are not present for utterances containing root infinitives, and so gradually, at about the

[3]The authors provide no quantitative evidence to support this claim.

same rate as monolingual children do, bilingual children all but abandon root infinitives by the age of 4. Thus, Hulk and Müller conclude that neither surface overlap nor involvement in an interface alone is sufficient for predicting cross-linguistic influence: both conditions must be met in order for such influence to be predicted.

It is important to note, however, that while Hulk and Müller (2000) point out that root infinitives in the target grammar are subject to discourse-pragmatic licensing constraints, the same types of constraints may not be at all the reason why children use root infinitives in declaratives. Wexler (1998) and Legendre et al. (2002), among others, argue that root infinitives are the result of a syntactic structure too impoverished to support full verbal inflection and appropriate case-marking on argument phrases. It would appear that, with different constraints at work—discourse-pragmatic constraints on adult root infinitives and syntactic structural constraints on child root infinitives—the relevance of this phenomenon to the syntax-pragmatics interface in *children's* speech is minimal. If the use of root infinitives in child productions is not related to the interface between syntax and pragmatics, then it should be argued that in fact *neither* condition on cross-linguistic delay is satisfied by this phenomenon. In the third chapter of the dissertation I return to this issue when discussing the development of finiteness (and the loss of root infinitives) in Spanish-English bilingual acquisition, which, rather than showing signs of delay, in fact reliably appears earlier in these bilinguals' English than it does in the speech of comparable monolinguals.

1.3.3 Moving beyond delay and into interference

Since the publication of Müller and Hulk's (2000, 2001) proposals regarding the constraints on cross-linguistic influence in bilingual children's early speech, several studies have been designed to test predictions made by their account—and have obtained mixed results. Hulk and Cornips (2006) take word order to be a purely syntactic question not constrained by the 'interface' condition of the original Müller and Hulk formulation. They therefore expect to find no cross-linguistic effects in that domain between Dutch and several minority languages (e.g., Arabic, Sranan, French, Ewe) spoken by the participants. Conversely, they predict that there might be cross-linguistic interference in the acquisition of grammatical gender, since this resides at an interface between syntax, morphology, and lexicon. (Recall that the Müller and Hulk conditions emphasize the syntax-pragmatics interface but do not rule out that other interfaces with the syntax might also be vulnerable.)

Hulk and Cornips's predictions are not confirmed: they instead discover a difference in the *course* of acquisition of word order phenomena, where it was unexpected, although the difference is ultimately rectified and children reach the target grammar—that difference in course representing cross-linguistic *interference*, a qualitative divergence from monolingual acquisition tendencies. They also find evidence of *facilitation*, although they do not identify it as such. Dutch, like many Germanic languages, is a V2 language: in matrix clauses, the finite verb always appears in second position, after the first position that can be filled with virtually any constituent, e.g., a noun *phrase* as in (7), a pronoun as in (8a), or an adverb as in (8b).

(7) deze man **snijdt** de tomaat
this man cut.PRES the tomato
'This man cuts the tomato'

(8) a. ik **heb** een appel **gegeten**
I have an apple eaten
'I ate an apple'

b. toen **heb** ik en appel **gegeten**
then have I an apple eaten
'Then I ate an apple'

In the course of acquiring this V2 pattern, monolingual Dutch children typically pass through a stage in which they appear to have realized that their language is V2 but have not fully streamlined the movement operation that is required to raise a main verb into second position. Rather they 'invent' a dummy *do* usage (9), in which the lexical verb is left in its base-generated position low in the clause while an inflected form of *do* occupies second position—a strategy that falls out of use when the V2 rule is firmly in place (Van Kampen, 1997).

(9) ik **doe** ook praten
I do also talk.INF
'I am talking too' (Dutch monolingual, age 3;05:[4] Van Kampen, 1997)

The *bilingual* Dutch children in the study do *not* innovate *do*-support in their Dutch, instead converging on the target pattern (7) *earlier* than monolinguals: bilinguals do not adopt a makeshift dummy *do* strategy but rather proceed directly to the V2 construction. The authors hypothesize that this occurs due to influence of these children's other language—languages such as Moroccan Arabic, Sranan, and Ewe have mid-clausal (pre-object) word orders, which V2 effectively reflects whenever the subject is the first constituent.

Perhaps due to that same source of cross-linguistic influence, in 20% of embedded clauses bilingual children place the lexical finite verb in the wrong position, namely in an SVO order (10), instead of in the target sentence-final position.

[4]Children's ages will be notated in this format throughout, following the convention of the discipline: **years;months.days**.

(10) * dis id de man die **strijk** de broek (cf. ... *die de broek **strijk***)
this is the man who irons.PRES the trousers
'This is the man who irons the trousers' (from Hulk and Cornips, 2006)

This performance deviates from that of monolinguals and displays interference: in the case of embedded clauses, bilinguals incorrectly raise finite verbs to a position preceding the object significantly more often than bilinguals do, and the source of the error is traceable to bilinguals' other language. They also uncover a delay in children's acquisition of the correct determiner-gender in Dutch, but this they attribute to an impoverished input from the children's parents who are themselves L2 learners of that language, rather than to cross-linguistic interference. In this case, the given lexical items had not, by the time of the study, reached the threshold necessary for the children to acquire them successfully.

In a similar vein, Döpke's (1998) research on bilingual German-English children has led her to conclude that partially overlapping structures in the input—one of two conditions stipulated by Müller and Hulk as necessary for transfer—create structural saliencies for the child before they are functionally accessible. Döpke deems the cues of the relative placement of finite verbs and XP arguments to be 'partially overlapping'. In particular, German-English bilingual children need to resolve a three-way contrast in the relative placement of **V** and *XP*, as opposed to the simple binary contrast that monolingual German children must attend to.

The same *kind* of argument can occupy two discrete positions in German relative to the main verb: in matrix clauses, the main verb is in second position, and in these clauses the direct object *follows* the verb (11a). But in embedded clauses, the main verb is in final position, so in these clauses the direct object *precedes* the verb (11b).[5] English does not mark the matrix/embedded clause distinction in the same way that German does, so it only provides evidence for the pattern that German matrix clauses contain (12).

(11) a. **V**_*XP* (German)

Marta **liest** *den Roman*
Marta read.3s the novel

'Marta reads the novel'

b. *XP*_**V** (German)

Marta sagt dass sie *den Roman* **liest**
Marta say.3s that she the novel read.3s

'Marta says that she reads the novel'

(12) **V**_*XP* in English

a. Marta **reads** *the novel*.

b. Marta says that she **reads** *the novel*.

Thus determining what *the* linear relationship is between a verb and its direct object in German-English bilingualism requires reckoning three possible combinations supplied by the input: German V_XP versus German XP_V; German V_XP versus English V_XP; and German XP_V versus English V_XP. In Döpke's view, it is 'interlanguage cue competition' that can be seen to give rise to cross-linguistic influence from English into German. The bilingual children in her study show an increased frequency of V_XP structures in German as compared with monolinguals. They also use AUX_V_XP order in German as an apparent influence of English and AUX_XP_V order in English as an apparent influence

[5] As Dutch is closely related to German, the Dutch examples in (8) can be viewed for a robust example of this contrast.

of German. The marking of finiteness is claimed to be associated with surface order of verbs and their complements in the children's German, rather than being associated with *functional* nodes and therefore hierarchical deep structure; this causes the production of non-target-like, doubly-marked VPs. Döpke takes these errors to be the result of an influence of English, which does not frequently mark finiteness overtly on lexical verbs. The competing cues of surface order and marking of finiteness are confounded by the child, who actively attempts to dissociate the two languages. In her discussion, Döpke suggests the possibility that surface similarities might lead to a jumbling of cues which could be observed in child productions; a mastery of a surface form in one language could lead to its misapplication in the other, as the underlying functional projections may still be lacking.

Notably, the errors in Hulk and Cornips (2006) and Döpke (1998) do not involve the syntax-pragmatics interface and so do not fulfill Müller and Hulk's Condition (A) on negative cross-linguistic influence. Thus on the most prominent theory of cross-linguistic influence to date these results are unexpected. Yet they are striking precisely because they are instances of qualitative interference, rather than the merely quantitative delay, and as such raise doubts about the proposal that knowledge of one of a bilingual's languages is isolated from knowledge of the other.

The role of language dominance

A bilingual child is by definition one who is exposed to two languages (by a certain age: Unsworth, 2004), but this does not entail that the exposure to each language is equivalent in quality or quantity. When exposure to the two languages does differ—or even when its outcome does, if, for instance, a child prefers to speak one language over the other—the language of greater exposure or experience may develop faster than the less-used one. This leads to an imbalance in the relative grammatical development, which can in turn influence the force that one language's regularities can have on the development of the other (i.e., can influence whether delay may arise, and in what direction). Several studies have shown that a language imbalance—being more dominant in one language than in the other—can correspond to instances of interference (Döpke, 1998; Yip and Matthews, 2000; Petersen, 1988). For example, during a period in which a Cantonese-English bilingual child was dominant in Cantonese, Yip and Matthews (2000) found that there was more cross-linguistic interference from Cantonese into English than in other periods in which the child's two languages were more balanced (as measured by MLU in each language). Language dominance is not *sufficient* in many cases to explain cross-linguistic influences, but it does appear to contribute much of the time. Another related phenomenon is also relevant to the issue of language exposure and the development of one language more slowly (or more inaccurately) than the other: there is a potential for development of features like agreement or tense *per language* that is attributable to language exposure without affecting the development of an individual language *on the whole*, i.e., without affecting the MLU by language. The possibility of developing, for instance, a structure in response to exposure to one language might influence the use of that structure in the other language, but might not contribute to causing the MLU to be higher in one language than in the other. The issues of language dominance and of the relative pace of structural development by language will be integral to discussions throughout the project.

1.4 Additional evidence of integration: structural priming

Spontaneous cross-linguistic syntactic interference presents an important challenge for the separate-syntax or isolation hypothesis. But it is not the only phenomenon to do so. Another is the experimental finding of robust cross-linguistic STRUCTURAL PRIMING, e.g., when a bilingual speaker of Spanish and English hears a passive in Spanish, she is likely in her next production to use a passive, even if that next production is in English (Hartsuiker et al., 2004). Syntactic priming broadly refers to the tendency to produce sentences containing previously experienced syntactic structures (Bock, 1986); this tendency is often interpreted as being the result of the alignment of production procedures between speakers (e.g., Pickering and Branigan, 1998) or as the result of implicit learning or enhanced activation of structural representations (Kaschak, 2007; Ferreira et al., 2008; Chang et al., 2000).

Regardless of the precise explanation of the phenomenon, Hartsuiker et al. (2004) showed that this tendency is present in adult bilingual speakers between their two languages just as it is in monolinguals' single language. They employed a confederate scripting paradigm to investigate bilinguals' susceptibility to cross-linguistic syntactic priming. Under the guise of a study about how bilinguals communicate, a confederate to the experimenter engaged in a picture-description task with the participant; in English, the confederate would describe a picture of a transitive action using either an active or a passive structure, and the participant would respond in Spanish with a description of another card displaying another action. Hartsuiker and colleagues found that participants' tendency to produce either an active or a passive sentence in Spanish was dependent upon the structure in the previously heard English stimulus. They therefore proposed a 'shared-syntax, shared-semantics' model of bilingual grammatical architecture, in which each abstract syntactic construction is connected to both languages (via their associated lexical items), as shown in Figure 1.1.[6]

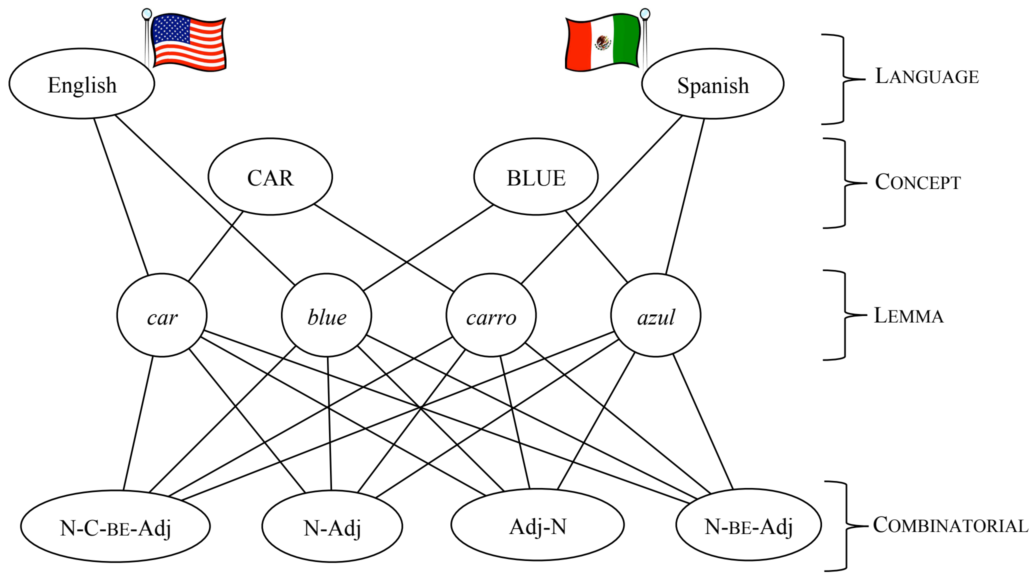


Figure 1.1: Partial model of bilingual grammatical mechanism, adapted from Hartsuiker, Pickering, and Veltkamp (2004)

The two language nodes, one for each language the speaker knows, are activated automatically by the linguistic context or intentionally (but indirectly) by a speaker's decision to use one language or the other (see Meuter, 2005, for a review of bilingual language selection processes). These elements serve to identify basic lexical items (lemmas) with the appropriate language. The lemmas are in turn connected to conceptual nodes, which are nonlinguistic and therefore not associated with one language or another; the fact that translation equivalents are linked to the same conceptual node is helpful for explaining a lexical boost in syntactic priming studies (e.g., Schwartz and Kroll, 2006; Schoonbaert et al., 2007),

[6] In case it is not transparent to the reader: the lowest level of nodes contains syntactic constructions/ structures, involving nouns (N), complementizers (C), copula (be), and adjectives (Adj).

patterns of word-naming latencies within and across languages (e.g., Costa and Santesteban, 2004), the relation of homographs to reaction times in lexical-decision tasks (Dijkstra et al., 1998), and cross-linguistic interference effects in picture-word naming paradigms (Costa et al., 1999). The final set of basic connections is between lemmas and combinatorial nodes (syntactic representations), which are simplified for the sake of exposition in the model shown in Figure 1. In principle, in addition to being connected to combinatorial nodes (the constructions above, i.e., N-Adj, Adj-N), lemmas are linked to grammatical features (i.e., tense, aspect, number) and syntactic category information (i.e., noun, verb).

This model is a strong complement to the theoretical accounts typically supplied in corpus studies of interference in acquisition, in that it makes a series of predictions that have since been verified empirically. First, it predicts that cross-linguistic syntactic priming with adults is possible in more contexts than the one that inspired it. This has been shown extensively with comprehension-to-production priming, for a variety of language pairs (e.g., *Korean-English*: Shin and Christianson, 2009; *Dutch-English*: Desmet and Declercq, 2006; *Dutch-German*: Bernolet, Hartsuiker, and Pickering, 2007), and for a variety of constructions (e.g., *dative alternation* in Dutch-English: Salamoura and Williams, 2007; *active/passive alternation* in German-English: Loebell and Bock, 2003; *clitic-climbing* in Spanish-English: Meijer and Fox Tree, 2003). Comprehension processes can be primed cross-linguistically as well, as is seen using reading time measures (Weber and Indefrey, 2009).

Second, it should be the case, according to the shared-syntax model, that cross-linguistic (between-language) priming is just as robust as monolingual (within-language) priming. While some experiments have reported a discrepancy between these two priming contexts in favor of within-language priming (Desmet and Declercq, 2006; Schoonbaert et al., 2007), a recent study demonstrated that with a consistent design and a consistent subject pool, between-language priming is as robust as within-language priming for bilingual adults (Kantola and van Gompel, 2011). Kantola and van Gompel (2011) alleged that if the grammars used for a bilingual's two languages were separate, then there should be a weaker priming effect across languages than within one language alone; if the grammar were shared, priming should be just as strong in both conditions. They showed using a written sentence completion task with Swedish-English bilinguals that between-language priming of the dative alternation is just as strong as within-language priming, which suggests that the construction accessed during a bilingual's act of monolingual comprehension and production functions in the same way whether the language of the discourse varies or is held constant.

Third, the model predicts that the combinatorial characteristics (i.e., the ordering of lexical items within a phrase as well as the order of constituent phrases) of the construction in question should be consistent between the language in which the priming utterance is experienced (the source language) and the language in which the primed structure emerges (the target language). The evidence on this front is mixed, with some studies showing a strong discrepancy between cross-linguistic priming depending on constituent orders and others showing little effect of this. Bernolet et al. (2007) compared relative clause priming in English-German, where the word order differs (akin to the contrast in (8) above), to the same phenomenon in Dutch-German, where it is the same; English and German relative clauses did not prime, but Dutch and German relative clauses did. On the other hand, despite differing headedness of the constituents in question, Shin and Christianson (2009) found that dative alternation presented in Korean primed the same variant of the alternation in English, regardless of whether the word order within the constituents was shared (although when word order was shared, priming was stronger than when it was not).

And fourth, if the shared-syntax model accurately represents mature bilingual grammatical knowledge, then some version of it should also be applicable to children's linguistic behaviors. Structural priming with children works in the same way as in does in adults, and as such it has been used to demonstrate the existence of abstract structural representations in young children's grammar (cf. the discussion in Rissman et al., 2013, who prime morphosyntax in children as young as 2–3 years old). In a comprehension-to-production priming task using the active/passive alternation in Spanish and English, bilingual children 5 to 6 years old have been shown to reuse structure previously processed in the input, e.g. hearing an English utterance with a passive structure and producing their next Spanish utterance with a passive as well (Vasilyeva et al., 2010). This children's result is of particular import because, although it can be taken for granted that by age 5 or 6 children do have abstract syntactic structure available, this cross-linguistic syntactic priming indicates the availability of *linked* abstract structure across languages, in direct contrast to an isolation hypothesis.

While I do not adopt the Hartsuiker et al. model in this dissertation, the above lessons apply more or less straightforwardly to the account that I propose here—they support the integration hypothesis (and would require an objectionably large amount of extra machinery to receive an adequate accounting on the isolation story). The final piece of evidence that argues against the isolation hypothesis is FACILITATION, as mentioned previously, but I do not entertain this at any length in the introduction because while there are only two findings of it in the literature (Kupisch, 2007; Liceras et al., 2010), facilitation effects lie at the core of this dissertation; I therefore leave that discussion to Chapters 2 and 3.

1.5 Apparent challenges to integration

Naturally if *all* of the data on bilingual development pointed toward the integration hypothesis, the isolation hypothesis would not have become and remained so prominent in the field, so it is important to review the data that have traditionally been taken to support this latter hypothesis. The first set of such data are sociolinguistic, referring to the tendency of bilingual children to use the right language with the right interlocutors. Genesee et al. (1996) investigated children in 'one-parent, one-language' households to discern the *children's* tendency to observe that linguistic strategy. Both in the case of conversations with each of the parents and in the case of conversations with foreign interlocutors, i.e. individuals previously unknown to the children, each child predominantly used the *interlocutor's* language, whether it was the child's stronger or weaker language.[7] This behavior suggests that the child 'knows' the difference between the two languages, a finding that is further supported by the sorts of anecdotes that even proponents of a fused system supply:

(13) Following a remark by her native Italian-speaking father in German, the bilingual

[7]When each child was forced by this social circumstance to use her weaker language, more code-mixing from the stronger language occurred, but this likely reflects not a preference to use the stronger language with an adult speaker of the weaker one but rather a (temporary) deficit in the lexicon.

child Lisa protests:

(Lisa) No, non puoi. ('no, you can't')

(Father) Ich auch...spreche Deutsch ('I too speak German')

(Lisa) No, tu non puoi! ('no, you cannot')—*extremely upset* (from Volterra and Taeschner, 1978, p. 326)

Moving into their third and fourth years of life, bilingual children are therefore not only likely to use the right language in the right context, but in fact are cognizant of the different roles that the two languages play in their social milieu. I do not believe, however, that in principle this type of behavior poses a serious challenge to the adoption of an integration hypothesis: no matter how the child herself conceives of her two *languages* for communication in her environment, the underlying system of abstract representations that generates her utterances in each may be conjoined or may be separate.

As I will discuss throughout the dissertation, that a speaker can choose which language to use at a given time can be explained along similar lines to the possibility of a speaker choosing to emphasize a certain part of the idea she wishes to convey—say by selecting a certain construction, such as a passive, that makes a patient more informationally prominent. Just because a speaker can choose to use a passive as opposed to an active construction does not mean that she recruits a wholly distinct grammatical system to produce that passive; it is simply one of several options that she chooses within her grammar. And also as in the case of the active/passive distinction, in many instances the speaker will *not* explicitly, consciously choose to emphasize any particular constituent (or, analogously, to use one language as opposed to the other), and it will instead be forces within the speaker and as well as external to her—like the communicative context—that condition which option emerges (e.g., as in structural priming). Evidence that children use the right language at the right time, then, does not impinge upon the integration hypothesis in any meaningful way.

A stronger challenge to the integration hypothesis comes from research that documents particular features of bilingual children's grammar developing for each language at different rates. Paradis and Genesee (1996) examine the development of a number of functional categories in the speech of French-English bilingual children (ages 2–3), and they conclude that the data show no evidence of transfer of any kind, neither interfering nor facilitating. Their analysis shows three children developing finiteness, negation, and pronominal subjects at rates similar to monolingual acquirers of each language, and, crucially, at rates different *for* each language.

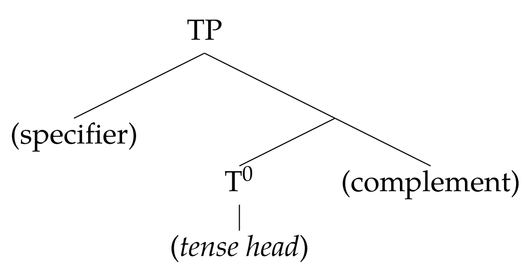
While it is easy to see why these data can be taken as evidence for an isolation hypothesis, the picture that they form is perhaps more complex than the authors acknowledge. Their criterion for nonfiniteness in French is that verbs "appear to be either past participles or infinitives," while for English nonfinite verbs can be "verbs in the present continuous form (verb-*ing*) without a tensed auxiliary" or "verbs in the present simple, without the obligatory *-s* for third person" (pp. 11–12). Context is also used in determining nonfiniteness for both languages, and in contexts in which an adult would be expected to use the progressive form the child uses the simple present, that too is counted as a nonfinite child form. The criticism that Paradis and Genesee's findings are subject to, then, is that their criteria for finiteness overlook some commonalities that the two languages do share:

when an English-speaking child uses a bare present participle like *eating*, for example, there is indeed no finiteness represented on the verb, but there *is* aspect,[8] which requires its own functional projection just like tense does in French[9]—and so the same amount of structure is plausibly used in French finite utterances and in these English [-T] but [+ASP] utterances. Therefore it is possible that tense and aspect compete in precisely parallel ways for realization in a bilingual child's two languages, but that not both can be realized because the child cannot project multiple functional projections—for either language. In other words, the grammar is not adult-like for either language, but in French the effect is masked, while in English it is apparent. The development of verbal inflection in bilingual grammar will be the focus of the second chapter, so I leave further discussion of that issue to the next chapter.

Keeping in mind, then, that the evidence typically brought out in support of an isolation hypothesis is at least compatible with, if not downright supportive of, the right characterization of the integration hypothesis (with, e.g., Paradis and Genesee, 1996), I turn now to theories of syntactic development, making explicit a commitment to a gradual structure-building hypothesis insofar as it is maintainable, before moving on to the body

[8] ASPECT is a grammatical category along the same lines of tense and agreement. It is a feature associated with verbs, and it expresses the temporal character of an event (e.g., whether the event is ongoing or completed).

[9] A FUNCTIONAL PROJECTION refers to the X-bar-theoretic, phrasal projection of a functional head like T^0 or ASP^0: a T^0 head cannot just be glued onto a syntactic tree but rather comes along with a little piece of structure including a complement position and a specifier position. For example:



of the dissertation.

1.6 Theories of syntactic development

In considering that surface similarities may lead a child to posit certain underlying structures that may or may not match up in the target grammar, which will make possible the prediction of the cross-linguistic influences sought here, it is necessary to specify the sort of linguistic development the child actually undergoes. Certain theories of language development posit more innate structure than others, some make predictions about the course of the acquisition of functional projections, and all could potentially be informed by bilingual development as well. A brief overview of three major linguistic developmental programs lays the requisite groundwork for the investigation of the pieces of grammatical knowledge that form the focus of this project.

1.6.1 Full competence hypothesis, or strong continuity

Of the three positions that have been staked out in the generative tradition, the FULL COMPETENCE hypothesis posits the greatest amount of initial structure (e.g. Hyams, 1996; Poeppel and Wexler, 1993). This hypothesis says that the child grammar is subject to the same constraints and rules as is the adult grammar; all performance disparities are attributed to morphological deficits (Déprez and Pierce, 1994), and to delayed acquisition of the pragmatic component (Hyams, 1996). Hyams and Déprez and Pierce term the *identity* between the child grammar and the adult grammar 'strong continuity' because there is no break—in fact, there is no difference at all—between the state of the child grammar and the state of the adult grammar, structurally and functionally speaking. If an adult UG is the target state of the grammar, then full competence should be understood as the *null hypothesis*: there is no developmental change between the grammar of the child and the grammar of the adult.

The Hyams (1996) account of delayed acquisition of the pragmatic component of the grammar is another version of the full competence hypothesis. On the basis of the null subject phenomenon and the root infinitive phenomenon, Hyams draws a comparison between the underspecification of D and the underspecification of T as functional heads: a child has all functional projections but not all of the features that would fully specify them. An underspecified D, she argues, leads to determinerless DPs, a lack of scrambling in languages that generally permit it, and a deictic *familiar* interpretation (15); an underspecified T, in a parallel manner, leads to root infinitives, null Case (which may also imply null subjects), and a deictic *here and now* interpretation (14).

(14) a. *Wayne in garden (Radford, 1990)

b. *Niekje ook boot maken
Niekje also makes boat
'Niekje also makes *(the/a) boat'

c. Papa heft ook trein
Daddy had also train
'Daddy also had *(the/a) train' (Dutch: Schaeffer, 1994)

(15) a. pas manger la poupée
not eat.INF the doll
'The doll doesn't eat' (French: Pierce, 1999)

b. Thorstn das haben
Thorstn that have.INF
'Thorstn has that' (German: Wexler, 1994)

Children's utterances in which D and T are underspecified are anchored to the discourse by a default deictic interpretation. The default interpretation compensates for the pragmatic components that will enter later into the child's grammar—such as the temporal feature housed in T and the definiteness feature housed in D—and so the shift to the adult grammar involves not a restructuring of the syntax proper but of the syntax-pragmatics mapping. The pragmatics that would in the child grammar have been determined by discourse-interpretation come instead to be linked to features in the syntax, but, crucially, the syntax itself has not changed over the course of the child's linguistic development.

In a similar vein, arguing as much on empirical grounds as on theoretical ones, Lust (1999) has contended that on the full competence hypothesis the 'delays' in acquisition are due to the need for language-specific integration of the operation of distinct modules of the Universal Grammar (e.g., syntactic minimality, finiteness of embedded complement, and lexical aspects of the main clause verb, in the case of the development of control structures). The course and method of modular integration are not determined by UG, so that integration must take place on the basis of sufficient external, language-specific evidence. Lust argues that UG itself is the determinant of 'delays', is the major constraint on child grammars, and is the guiding force in the acquisition of target grammar. Since UG contains only universal principles, and these principles need to be integrated into language-specific grammar, some initial difficulties are expected.

The full competence hypothesis thus has taken on several forms, attributing deficiencies in children's linguistic production to a lack of either morphological, pragmatic, or operational components. The one thing, however, that full competence does *not* accept as possibly absent from children's mental representations of their language is the full adult syntactic structure itself, but for various reasons, other linguists have rejected this hypothesis.

1.6.2 Maturational hypothesis

In contrast to full competence is the MATURATIONAL HYPOTHESIS of language development, which alleges that syntax develops on a genetically determined schedule. The earliest discussions of a genetically constrained maturational hypothesis addressed a concern that there could be no pressure for theoretical conservatism within such a hypothesis like full competence, nothing to prohibit the theory from assuming that the child grammar contained myriad elements that were absent even from the adult grammar (Gleitman, 1981; Pinker, 1981, 1984). But Borer and Wexler (1987) responded to the challenge with UG-guided maturation, or the assumption that at no point during cognitive maturation are mental representations external to UG possible, thus restricting the potential initial states of the grammar to various subsets of the adult UG representation. For example, Babyonyshev et al. (2001) show that Russian children understand the several properties of a particular construction that has to do with certain verb types, even though they are not usually able to produce the construction properly. In other words, children are *aware* of a contrast that they cannot productively use, because their grammar has not matured to the point at which it could represent the relevant features—an instance of the classic comprehension/production asymmetry.

In order to counter the possibility of an *under*specified child grammar, in some work (e.g. Wexler, 1998), Wexler initially posits child-specific constraints, such as the *Unique*

Checking Principle (UCC), meant to handle root infinitives,[10] and separately, he and Borer (Borer and Wexler, 1992) argue for the *Unique External Argument Proto-Principle*, meant to account for 2-year-old Italian children's behavior that seems to require each verbal element have *its own* subject. However, Wexler eventually abandons such child-specific constraints in favor of the maturational, broad *Proto-UG* sketch that he presents in Wexler (1999), in acknowledgment of the *learning* challenge inherent to a theory that does not respect the original concerns aired by Gleitman and Pinker.

The prevailing version of the maturational hypothesis (Radford, 1990; Wexler, 1999) thus presumes that functional categories emerge sometime after lexical categories do, according to a species-wide genetic predisposition. (Harris and Wexler, 1996) understand the relevant functional categories to exist in the child's mind from the first—but the categories will be suppressed, inaccessible, until a certain point in her cognitive development (usually around age 2;6). Note that this is presented in contrast to the position (e.g., that of Radford, 1996) stating that functional categories emerge on the basis of exposure to phonological items that would support the development.

Rizzi (1993) offers his own version of this hypothesis as well, termed the TRUNCATION HYPOTHESIS: in an early stage of language development, the syntactic structure itself is truncated below the highest functional projection, which accounts for a variety of options systematically available to the child speaker (but not the adult speaker, under normal circumstances): instead of $[_{CP}\ [_{TP}\ [_{VP}]]]$, the child might project only $[_{TP}\ [_{VP}]]$, which would leave the child without the resources to produce all of the pieces of an adult form. This hy-

[10]Root infinitives are infinitive forms that appear in main-verb positions: *'Dana **ride** a bike' (cf. 'Dana **rides** a bike'; the examples in (14) are also representative of this phenomenon.

pothesis neatly predicts systematic variability in children's inflectional paradigms. It also allows for variability within children's speech, given that utterances at any particular stage of development do not have to reflect an *overall* mastery of this particular parameter-setting or that integration of modular principles. Errors both of omission and commission may be accommodated by the truncation hypothesis, since some, but not all, of the structure above VP is absent.

The initial clausal representation contains at least some inflectional elements, which yields the correct prediction that root infinitives in null-subject languages with rich agreement are less common than they are in languages without pro-drop and with poorer inflectional morphology. This does not, however, account for the broader category of default forms identified by Davidson and Legendre (2003), which includes both root infinitives and third-person default forms in the case of Catalan; it is not clear whether these could be as readily accommodated to the truncation hypothesis, construed as a maturationally predetermined acquisition process. If a limited structure is available and these forms do not appear to receive any inflection, then the question arises of why even a TP need be included.

1.6.3 Gradual structure-building, or weak continuity

A final alternative is GRADUAL STRUCTURE-BUILDING, sometimes called WEAK CONTINUITY, which posits that the infant's syntax is deficient in the sense that functional projections are only acquired on the basis of lexical and morphological evidence. This hypothesis assumes that the child grammar does not contain any material absent from the adult grammar but that the child grammar actually lacks certain target structures, which it will eventually develop when the child has been exposed to a certain threshold of primary linguistic data. Radford (1996) argues that functional categories are not in any sense present in the Language Acquisition Device (LAD) of a child who has yet to develop certain lexical categories.

Although the *principles* of X-bar theory are already present in the child's LAD, she builds her grammatical structure only as she encounters lexical and morphological items that would lead her to hypothesize it. Weak continuity assumes that a child does not develop certain functional heads without positive phonological evidence for them. Gradual structure-building is compatible with the *small clause* analysis of English-speaking children's early sentences which contain uninflected verbs in many cases (Radford, 1988). This phenomenon, of the root infinitive (and in some Romance languages, the default form: see Davidson and Legendre, 2003), can be attributed to a lack of any function projection higher than the VP; without a tense phrase (TP), there is no way for a verb to become inflected. Similar analyses can be given for other such systematic errors in children's speech on this view, which combines UG principles with exposure-based functional-projection acquisition.

It is gradual structure-building that I implement in OT terms, following much of Géraldine Legendre's work on syntactic development from this theoretical standpoint (e.g. Legendre et al., 2002), though for the moment I set aside the details of the implementation. The framework of Optimality Theory (OT: Legendre et al., 2001; Prince and Smolensky, 2004), in reflecting gradual structure-building, depicts grammar as relying upon the strict ranking of universal, violable constraints. Its affinity to gradual structure-building permits a formal accounting of acquisition data, elegantly capturing optionality and stages of development, an extended illustration of which I will present in Chapter 2. The precise accounting of how OT aligns more generally with bilingualism will become clear over the course of the ensuing presentation. Yet it is clear that this hypothesis in a sense contains 'the best of both worlds', in that constraints on grammatical structure in the individual (and on the typology of languages found worldwide) are innate, yet the *ranking* that is established in order to produce adult-like outputs develops in response to primary linguistic data. In this way there is nothing apparently *unlearnable* about language (*contra* Pullum and Scholz, 2002), although language development is fundamentally responsive to exposure to linguistic input, including the abstractions that the speech stream reflects. Most importantly for the bilingual acquisition context, gradual structure-building allows structure to emerge for one language, or the other, or both, depending upon what data the child has received, and permits the grammar to adjust in response to this data no matter which language it is presented in.In what way that structure is limited in child grammars, and how the child overcomes those limitations, occupies a good deal of my attention below.

1.7 Summary

In this introduction I have reviewed the major findings of cross-linguistic influence in bilingual grammatical development as well as a series of results pertaining to real-time bilingual language use phenomena, both of which seem to point more toward an integration hypothesis of bilingual grammatical architecture than toward an isolation hypothesis. The theories of grammatical development presented impose an important constraint on just how either kind of hypothesis might be realized in the developing mind of a bilingual child, as well as what kinds of cross-linguistic influences beyond those already attested might be predicted.

This dissertation explores the integration hypothesis of bilingual grammatical development and maintenance by focusing on Spanish-English bilingual acquisition in simultaneous and early sequential bilinguals from age 1 to age 5. I examine two sides of cross-linguistic influence—facilitation and interference—using data drawn from an elicitation experiment as well as spontaneous speech corpora. In the case of the copula (ch. 2) and *wh*-questions (ch. 3), I show that bilingual children acquire some constructions in English more efficiently and earlier than their English monolingual peers do, in line with the monolingual Spanish time-course of acquisition but in *both* languages. While the empirical results are striking, the principal contribution of this dissertation is not intended to be the demonstration of the existence of the phenomenon of cross-linguistic facilitation; rather, it is the task of this study to present a formally compelling integration account of bilingual grammatical architecture, one that could give rise to cross-linguistic influences of all attested varieties. To that end I also characterize cross-linguistic interference (ch. 4) from the same standpoint as the facilitation findings, showing that it is possible to account for both positive and negative effects on grammatical development stemming from bilingualism.

Chapter 2

Facilitation in TP: BE

2.1 Development of TP

Decades of research on language acquisition have established patterns of systematic errors in children's very early speech. In many languages, the first words to be produced, around age 1, fall into the adult category of 'noun', followed by words classified as 'verb' and often some fixed expressions like "No" and "Bye-bye" (Gentner, 1982; Bates et al., 1991). Children then begin combining those classes of words, sometimes in creative ways, like the "all-gone sticky" of linguistic lore (Braine, 1963), or more simply like any number of combinations of a (subject) noun and a verb, or a verb and a (direct object) noun, that an 18-to-24-month-old might produce. Past this period of similarity across languages—that is, beyond age 2 or so—the traits typically present in children's speech begin to diverge, and the characteristics of the target grammar are manifested more clearly in their utterances: children acquiring V2 languages produce mostly V2 constructions (e.g., Poeppel and Wexler, 1993); children acquiring non-null-subject languages use more overt subjects than their pro-drop-acquiring counterparts (e.g. Yang, 2004).

Differences in syntactic *error types* are also apparent cross-linguistically, but they do not seem to have their basis in different *kinds* of language exposure that children in different cultures might receive, e.g. by provision of explicit correction. Rather, these differences can be attributed to the abstractions, or lack thereof, that children are able to represent at a given stage of their cognitive development. This is so because linguistic productions are underlain by abstract grammatical representations, and these can be innate or learned; as discussed in the Introduction, each of these two sources of language development likely contributes to the overall process. With this general picture of acquisition in mind, we can home in on a child's capacity for representing and producing morphemes that correspond to *abstract* grammatical features as one potential source of errors during development. Whether caused by genetically-specified cognitive maturation or exposure to primary linguistic data in the environment, the ability to produce the surface form corresponding to a sophisticated syntactic structure, with tense and agreement and information-structural features fully specified, often appears absent from the young child. Frequently, it seems, young children's utterances reflect a grammatical system that can only represent a small amount of structure—which is the cause of many of their errors (e.g., Rizzi, 1993; Legendre et al., 2002).

In this chapter I discuss the acquisition of the functional category 'T' as represented by the related phenomena of BE and non-finite root forms in Spanish-English bilingualism. In the course of seeking to understand the development of BE in Spanish, English, and the Spanish-English pair, I explore issues surrounding the acquisition of functional projections, several existing characterizations of BE, and predictions of cross-linguistic influence, facilitatory and otherwise, that depend upon the theoretical framework adopted. The chapter progresses in the following way: I begin with a theoretical discussion of the broader points concerning T—developing inflection and the functions and structures of BE—focusing on the characteristic omissions of such functional items in early child language (§2.1.2). I then discuss the roles that BE plays in adult language in both English and Spanish, homing in on an important related lexical contrast in Spanish. Following the adult presentation, in §2.3 I examine a collection of corpus data that bear on BE in *monolinguals* (so as to set the stage for the later *bilingual* data), after which we make our first foray into an Optimality-Theoretic account by analyzing the monolingual data in a way that can eventually be extended to the bilingual situation. Once the monolingual patterns are firmly established and accounted for, we turn to bilingual acquisition of BE, discussing and analyzing corpus data from Spanish-English bilingual children (§2.6). Before concluding the chapter, I also confirm an important prediction of the OT account developed for the bilingual data. By that point, the reader will have been introduced to the formalism that I use throughout the dissertation to embody my version of the 'integration hypothesis', which captures the existence and varieties of cross-linguistic influences that have been attested in the developmental literature on bilingualism.

2.1.1 Gradual development/activation of structure in acquisition

The development of inflection—tense, number, person, and others—marks a critical point in child language acquisition. After a first stage, starting at around 12 months, in which an infant typically produces only single-word, holophrastic utterances, and after a second, starting at around 18 months, in which she combines words into uninflected two-word utterances, the first signs of inflectional productivity emerge (Wexler, 1998). Around two years of age, when children begin to use lexeme-morpheme pairs that are not present in the linguistic input that they receive, some change must have occurred in their grammar to make this newfound productivity possible.

As reviewed in §1.6, different hypotheses have been proposed to explain this change, from 'strong continuity', claiming the full competence of Universal Grammar from the start and developmental changes attributable to, e.g., underspecification of features on fully formed structures (e.g., Hyams, 1996; Déprez and Pierce, 1994; Poeppel and Wexler, 1993), to 'constructivism', which does not claim that any abstract categories are assigned to the words that the youngest children produce and that structure is acquired through piecemeal acquisition of chunks of utterances which gradually become more abstract (e.g., Tomasello, 2000; Goldberg, 2003).

Some middle point between these two poles, perhaps along the lines of 'gradual structure-building' hypotheses that argue for the existence of *some* structure but that its full extent develops on the basis of linguistic input, is likely to have the most empirical coverage (e.g., Radford, 1996)—children's earliest utterances are reasonably uniform no matter what language they acquire, but the full extent of adult linguistic competence across the globe contains so much variation that it seems excessive to posit that *all* the principles constraining syntactic structures are present in the child's mind from birth. The gradual structure-building hypothesis competes most directly with a 'maturational' hypothesis, which states that the driving mechanism behind apparent grammatical change in young children is a genetically-specified development of further structure (e.g., Borer and Wexler, 1992; Rizzi, 1993; Wexler, 1999).

What all of these theories are out to capture is the passage from an almost purely 'referential' linguistic stage, in which every word refers to a thing in the world (e.g.,"Dan jump," "eat cookie"), to the stage where *functional categories* are produced by the computational system as well. The first-emerging functional categories include inflectional morphology and functional items. While inflectional morphology is usually understood to be bound and so requires a lexical host, functional items are free morphemes that require only a structural position to be available for them (and for that position to contain the collection of features that can be checked by those inherent to the functional item itself). Functional items and inflectional morphemes both lack referential status: there is nothing out in the world that is a 'the' or an 'apostrophe-s'. It is likely that this non-referentiality contributes to children's later acquisition of functional items, relative to the referential 'lexical items', which is the class comprised of members of the categories of noun, verb, adjective, and so forth. Yet another, more theoretically driven hypothesis concerning children's frequent omission of functional items depends on the absence of abstract structure capable of hosting those items.[1]

2.1.2 Characteristic omissions of functional items

The development of functional categories in language acquisition is marked by systematic errors of omission: determiners (e.g., Clahsen et al., 1996; Guasti et al., 2008), subjects (e.g.,

[1]The development of inflectional morphology, and the omissions that frequently appear with respect to it, can also be explained along these lines, but for the sake of concision I will no longer mention inflectional morphemes and will only directly discuss functional items.

Bloom, 1990; Yang, 2004), and subject-verb agreement morphology (e.g., Radford, 1988; Poeppel and Wexler, 1993) are treated as optional by children in the process of acquiring their first language. As put concisely by Brown (1973, p. 75), "functors [are] more often omitted than contentives." While a majority of acquisition studies in the literature have focused on English, functional categories mark an area of acquisition in which a good deal is also known about several other languages, including German (Clahsen et al., 1993), Dutch (Jordens and Hoekstra, 1994), Italian (Bottari et al., 1998), French (Hamann, 2003), Catalan (Guasti et al., 2008) and Japanese (Clancy, 1985). These crosslinguistic studies go to show that the mere fact of constrained, non-random omission of functional categories cannot be attributed to language-specific features alone; each language may show a different pattern of omissions (e.g., Davidson and Legendre, 2003, which documents different rates of agreement vs. tense omissions in French and Catalan children), but it is rare (if even possible) to find a language that in the course of being acquired does not display at least some pattern of functional item omission. This in turn suggests that such omissions may illuminate some important feature of the cognitive apparatus involved in language acquisition.

In several of the aforementioned languages, it is the development of *finiteness*—the marking of tense/agreement on a verb—that passes through notable periods of optionality before converging on the target pattern. While children as young as two years old comprehend the basic tense distinctions of past, present, and future (Wagner, 2001), across the world's languages they do not reliably produce the morphological markers of these tenses until later, between ages three and five, depending upon a variety of language-specific factors (e.g., Hyams, 2007). Little is known about the development of finiteness in the speech of young simultaneous bilinguals. The few studies that have been conducted on this phenomenon in bilinguals have found that reliable use of finiteness marking in each of a bilingual child's two languages is comparable to that of monolinguals acquiring each one (Müller and Hulk, 2001; Paradis and Genesee, 1996),[2] by making the following comparison: morphologically richer languages (i.e., Italian and French) are acquired by these bilingual children alongside morphologically poorer ones (i.e., German and English, respectively). The usual finding is that the richer the morphology possessed by a language, the earlier finiteness is acquired, and the children in the Müller and Hulk and Paradis and Genesee follow this pattern *by language*, such that they produce more target-like verbal inflection in Italian and French than they do in German and English, respectively. Yet this contrast in the use of verbal inflection does not necessarily indicate that the grammatical system itself splits the two languages apart categorically, as those who have produced the findings claim; it could be that *the morphology* is subject to production difficulties, or any number of other possible explanations.

One possible explanation for the difference in rates of finiteness marking in young bilinguals' speech relates to their awareness and use of functional structure. I leave the details of this explanation to the body of the chapter, but in brief, for every bit more complex that an intended utterance becomes, more functional structure must be available to house it. If all that structure is not available to the young child, she will produce errors, lacking the ability to represent *all* of the functional features of the proposition. So for example, in line with the VP-internal subject hypothesis (Koopman and Sportiche, 1991; Sportiche,

[2]Given the large degree of individual variation evident in both monolinguals' and bilinguals' speech, such findings should be interpreted with caution.

1988), the smallest amount of syntactic material that can be used to produce an utterance is the verb phrase (VP), an instance of which is reproduced in Figure 2.1.

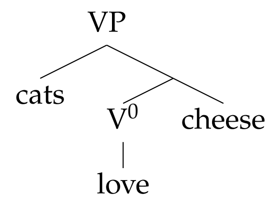


Figure 2.1: Minimal, VP-only tree structure for 'Cats love cheese'

This utterance appears target-like: each word is properly inflected, the order of the words is the adult one, and so forth. But this is arguably only the case because of the particular example chosen—in this English example, the 'inflected' verb form *love* is homophonous with a default, uninflected form (in contrast to a third-person singular form, which would need an /-s/ suffix to be grammatical). Similarly, *cats* is a grammatical, acceptable subject, because marking a noun (in contrast to many pronouns) in English as a subject does not require any overt reflection of Case (as a pronoun would, e.g., *I* vs. *me*). Nevertheless, more abstract structure than there is in Figure 2.1 is required for most adult-like productions. How does this structure come to be available to the child?

In a language like Spanish, the additional structure that is needed in order to satisfy the various grammatical requirements, e.g., on the subject and on the verb may be evident generally from of its system of rich verbal morphology and specifically of its system of BE verbs. The copula, expressed in English as *be*, is a verbal element that is traditionally held to carry no semantics; it is simply a vehicle for whatever tense, agreement, aspect, etc. features a language requires to surface in order for the derivation to go through. But there is a related type of verb, *aspectual* BE, that has the same lexical manifestation in English as the copula, which may obscure the fact that it is *different from* the copula. In Spanish, however, there are two different BE verbs, *ser* for the copula and *estar* for aspectual BE, and as such each has a different function; crucially, each function maps in its own way to syntactic structure (as we will see in Sections 2.2.1 and 2.4.1), which may lead the structures themselves to become more apparent to the learner. Because inflection (finiteness) and BE are both instantiations of T it is reasonable to ask whether there is a developmental link between the two within a single language of a bilingual and, adopting the integration hypothesis, across her two languages as well.I therefore begin my exposition with a careful look at the development of BE in Spanish-English bilingual children, and from the results and the interpretation I give them I then generate a prediction about the development of finiteness more generally in this population. By treating BE and finiteness as related yet distinct, we end up with a fine-grained picture of how *one* aspect of important syntactic knowledge, namely TP, develops in bilinguals, showing that indeed a shared system appears to underlie a child's capacity to speak in two separate languages.

While it is the objective of this chapter to address in detail the characteristics of Spanish-English bilingual acquisition of BE and corresponding markers of finiteness—and not all of those can be anticipated here—several points bear mentioning before we turn to the substance of the investigation. First, we will see that the stage in which BE is uniformly omitted by bilinguals is very brief, and after this, for a much longer period, children display some optionality with respect to their inclusion of that lexeme. This means that we will need to explain both why BE is omitted in the first place and why it appears subsequently to be optional, before it is used in a target-like way. Second, even within those periods of optionality, it is evident that further constraints act upon BE production, making omissions likelier with one type of predicate than with another. In this respect we will see the usefulness of examining acquisition data in informing our hypotheses about the adult grammar, subcategorical distinctions reflecting structures hypothesized to exist distinctly in the target grammar as well. Third, just as with any developmental investigation, the patterns that we will observe in this section are subject to individual variation that may make drawing conclusions more difficult, but fortunately sufficient spontaneous production evidence exists for us to test the current major hypothesis.

2.1.3 Be and TP

Those who argue for incremental structural development, either on the basis of the input as proponents of gradual structure-building claim, or on the basis of a genetic predisposition, as supporters of maturation propose, do so on the grounds that at least part of the time children's early speech characteristically lacks morphemes and lexemes that are generated as heads of functional projections, like the tense phrase (TP) or the complementizer phrase (CP). Evidence suggests that functional projections in their fully specified form emerge at different ages in children acquiring different languages, and as such, studying the development of functional projections in bilinguals is basic to understanding the organization of their grammar.

In the third chapter I will examine the development of CP in Spanish-English bilinguals by looking at *wh*-questions in acquisition, but in this chapter I focus on a smaller amount of structure—that is nearer the VP, and one of the first functional projections argued to appear—the TP.[3] Any finite clause has a TP as it is here that tense inflection is specified; in addition, many finite clauses will have other features like aspect, which require that more structure be projected in addition to TP (in the case of aspect, an aspectual projection 'AspP'). As we will see, the English lexical item 'be' actually masks the fact that BE breaks down into two categories, one of which requires this AspP and the other of which does not. Both, however, need the TP in order to surface (in a finite clause).

BE relies crucially upon the TP, as some variants of BE (i.e., the true copula) are base-generated in T^0 and others at least surface there (Guéron and Hoekstra, 1995; Heycock, 1995; Becker, 2000).[4] This description is true of Spanish as much as it is of English—for which it represents an exception to the general rule that finite verbs surface in V^0[5]—making BE an *a priori* plausible locus of facilitating cross-linguistic influence. Finite main verbs are base-generated in the same place in both languages as well: within VP. But while in Spanish both lexical verbs and BE surface in T, in English lexical verbs stay in VP even at Spell-Out, with any inflectional affixes being lowered onto them, while BE instead resides in T^0. This difference accounts for the systematic distinctions observed in English with respect to the relative order of lexical verbs and, for instance, negation, as the contrasts in (16) and (17) demonstrate. (The relevant tree structure is given below in Figure 2.3.)

[3]This discussion subsumes AgrP within TP; AgrP does not appear to play a crucial role in BE development or the related phenomenon of finiteness. Thus while AgrP may indeed be subject to the same forces that produce optionality of verbal inflection in the speech of many children (cf. Davidson and Legendre, 2003), it will not meaningfully inform the investigations here and so I do not include it in my trees or analyses.

[4]In the remainder of accounts the BE surfaces in T, having been base-generated lower, either in VP or in a related projection like PredP (cf. López-González, 2010; Bowers, 1993, 2001). Given the near consensus formed around ruling out the hypothesis that BE is base-generated in V^0, I give no further attention to this hypothesis, assuming instead that all types of BE, both individual-level and stage-level, are base-generated outside of VP. Beyond this assumption, where outside of VP each type of BE verb is base-generated will become clear as the exposition progresses.

[5]More will be made of this general contrast in Ch. 3, but for reasons that I give shortly it is not pivotal here.

(16) a. Milo **is** *not* a genius.

b. Milo does *not* **study** in vain.

(17) Milo *no* **es** genio .
Milo not is genius

Milo *no* **estudia** en vano .
Milo not study in vain

In this way the syntactic behavior of BE is more similar between Spanish and English than is the behavior of a typical finite verb.

The central goal of the current chapter is to identify the patterns of BE omission in early Spanish-English bilingualism, to compare these to the omission patterns found in the speech of English and Spanish monolingual children of the same level of language development, and then to offer an account of the mechanism that may drive any observed differences between the three groups.

2.2 Overview of BE in adult grammar

2.2.1 Defining categories of English BE

Since the late 1970s with Carlson's publication of his dissertation, *Reference to kinds in English*, the distinction between nominal and locative predicates has structured the discussion of the syntax underlying BE constructions (Carlson, 1977b). This distinction is captured in sentences such as (18a) and (18b).

(18) a. The object flickering beside me **is a candle**.

b. The flickering candle **is on the table**.

In (18a), the flickering object is a candle and will always be a candle, its 'candleness' being an inherent and permanent property of the thing. But the fact that it is on the table, as expressed by (18b), is accidental, temporary, and liable to change at any moment on my whim, if I choose to remove the candle, say, to the windowsill. Thus the distinction captures an intuitive contrast in the function of nominal and locative predicates: the former predicates a permanent property of an object, while the latter predicates a temporary property of an object.

That contrast is evidently a semantic one, and Carlson (1977b) breaks it down along the following lines: there are certain predicates, of which the nominal copular construction as in (18a) is perhaps a prototypical example, that apply to 'individuals', characterizing them in an inherent, essential, permanent way. Other predicates, represented prototypically by the locative BE construction in (18b), modify a spatiotemporal 'slice' of such an individual, that slice being labeled a 'stage'. The semantic analyses of individual- versus stage-level predication are well worn, and I would direct the reader to Carlson (1977b) and Kratzer (1995a) for thorough and canonical treatments and Becker (2000) for a rigorous overview. However, the semantic distinction results in a series of syntactic contrasts that deserve presentation because they emphasize the motivation for proposing a structural difference between sentences containing stage-level (SL) and individual-level (IL) predicates.

Syntactic consequences of BE contrasts

Kratzer (1995a) presents three grammatical phenomena that serve to illustrate the important contrast between SL and IL predicates: *there*-insertion sentences (Milsark, 1974), bare plurals (Carlson, 1977a), and absolute constructions (Stump, 1985). She illustrates these phenomena with the following pairs of sentences (Kratzer, 1995a, p. 25):

(19) *There*-insertion:

a. There are firemen available. [SL]

b. * There are firemen altruistic. [IL]

(20) Bare plurals:

a. Firemen are available. [SL]

b. Firemen are altruistic. [IL]

(21) Absolute constructions:

a. Standing on a chair, John can touch the ceiling. [SL]

b. Having unusually long arms, John can touch the ceiling. [IL]

The (a) examples contain typical SL predicates, while the (b) examples contain typical IL predicates; the contrast leads to different syntactic consequences in each sentence pair. In (19), *there*-insertion cannot be used with the IL predicate, resulting in the ungrammaticality of (19b). In (20), (20a) can mean that there are firemen around, but (20b) cannot mean that there are altruistic ones around. And in (21a), a conditional recasting is acceptable, as in "*If* John stands on a chair, he can touch the ceiling," while such a recasting is infelicitous for (21b).

These contrasts hinge on a distinction that could appear principally semantic, but that distinction has been argued to be reflected in the syntax (e.g. Schmitt, 1992; Kratzer, 1995a; Camacho, 2012). Specifically, BE when used with an SL predicate heads an aspectual projection, 'AspP', while when used with an IL predicate it does not; related to this, SL BE has a valued, uninterpretable aspectual feature, while IL BE does not (and which, for instance, adjectives that can be aspectual or non-aspectual predicates can optionally be able to check). The aspectual projection arises out of the Event argument that a stage-level predicate (adjective, locative, etc.) projects. Becker argues that the event projection needs to be present in the syntax in order to accommodate the existential 'there' construction, and in particular to base-generate the existential quantifier; others have claimed that instead the eventivity of the stage-level predicate is simply captured as a semantic argument and that the aspectual projection would be sufficient (e.g., Heycock, 1994; Felser, 1999; Kratzer, 1995b). In my analyses I adopt a structure that does not include the event argument for the sake of simplicity; nothing turns on the decision.

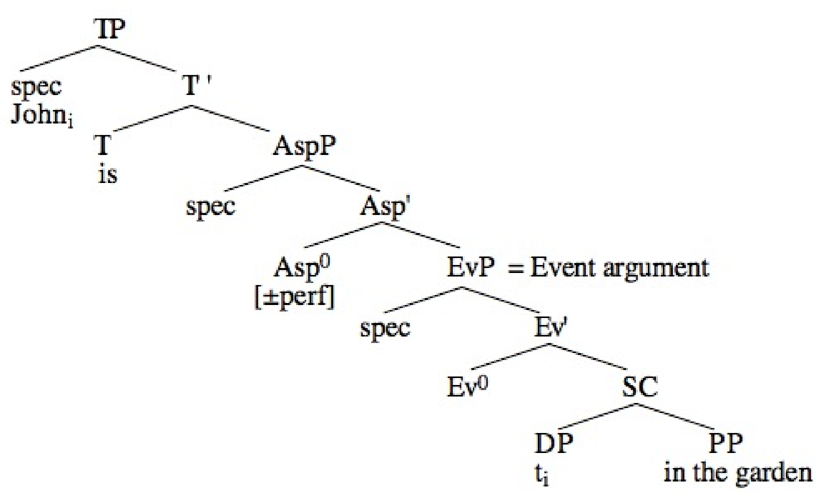


Figure 2.2: Stage-level predicate structure as in Becker (2000)

The structure of stage-level main clauses taking the form shown in Figure 2.2 permits any kind of complement to appear alongside the DP within the small clause (SC). Although the example above is presented with a PP complement, an AP complement could just as well occupy that position, an important consequence of positing the structure in this way. A PP complement will virtually always require the projection of an AspP, given the meaning a PP usually represents: something to do with time, or location, or manner, which tend to correspond to a perfective aspect. Though such a categorical generalization cannot be made with respect to *all* adjectives, there are many adjectives that do indeed require the projection of AspP—canonically temporary adjectives like *sleepy* or *invigorated*. These adjectives have a perfective feature to be checked, just like PPs tend to have, but a different adjective like *tall* or *innovative* that did not have this aspectual character would not trigger the projection of the aspectual phrase, which in turn would result in an individual-level predicate structure, as shown in Figure 2.3.

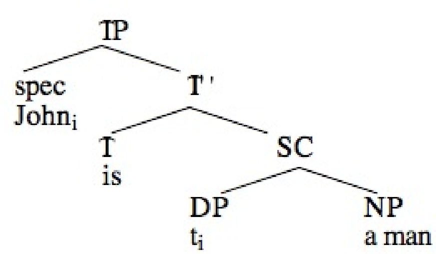


Figure 2.3: Individual-level predicate structure as in Becker (2000)

This structure, shown here with a canonical, individual-level NP complement, would also house an individual-level adjective in a predicative construction. It should be recalled that in spite of these structural differences there are few surface-level contrasts that make the distinction clear in English from a syntactic point of view (*John is in the garden* ∼ *John is a man*; *Jill is invigorated* ∼ *Jill is innovative*). I will return to these similarities and contrasts when reviewing the bilingual acquisition data and confronted with the need to consider just how parallel the two languages' BE verbs and their corresponding structures seem to be.[6] At present, Becker's analyses seem to have the most empirical coverage of the existing proposals, and so they provide a good point of departure for understanding the English acquisition patterns below.

2.2.2 Spanish BEs and their multiple interpretations

Two BE verbs exist in Spanish, *ser* for use with most individual-level predicates, and *estar* for use with most stage-level predicates (De Mello, 1979; Diesing, 1992). It is therefore possible to break apart the function of these verbs along the lines of an aspectual distinction, as Carlson and Becker, among others, have done. Yet this may be too coarse to accurately capture when each lexical item is used, and in order to make predictions about cross-linguistic influences that Spanish may exert on English, we need a clear understanding of what the Spanish BEs' functions (and consequently their syntactic realizations) are.

Spanish BE and predicate type

The traditional, grammar-book way of understanding the contrast between *ser* and *estar* is to take them as mapping into different kinds of predicate ascriptions: *ser* is to be used with permanent or inherent properties, while *estar* is to be used with temporary or accidental

[6]This syntactic distinction just presented can be used to account for cross-linguistic variation in overt vs. null BE distributions, as in languages like Russian, in which the overt BE in non-present tenses corresponds to case-marking and structural options that fall out along the IL/SL lines of contrast (Matushansky, 2000); or like Hebrew, in which BE is obligatorily overt in generic expressions, obligatorily null when an inherent-property meaning is blocked, and optionally overt if a generic, inherent reading would be coerced (Greenberg, 1994); or like the present case of interest, Spanish (and Portuguese), where the distinction is captured by a pair of contrasting BE verbs whose corresponding predicates also behave differently with respect to structural options (e.g., small clause constructions: Schmitt and Miller, 2007).

ones (De Mello, 1979; De Mello and Bolinger, 1980; Diesing, 1992). This characterization leads De Mello (1979) to deem *ser* 'meaningless', as it does not import any information over and above what is supplied by the predicate nominal, locative, or adjective. Proponents of this interpretation of the Spanish BE system also attribute no meaning as such to *estar*. On this account it is *estar* that is selected by a predicate, depending upon whether that predicate is an IL or an SL one; when *estar* is used to coerce a temporary interpretation of an otherwise permanent property, it can do so because the option was already available for that predicate.

The trouble with the 'predicate type' explanation of the distribution of Spanish BE is that it fails to capture the diverse and subtle facts surrounding that distribution. A small but frequent class of predicates characterize permanent properties but are used with *estar* (e.g., 'dead', 'broken', 'married'), for instance. De Mello (1979)'s discussion of *ser* as meaning "to take place" or "to exist," while he claims that *estar* could be translated as "to be located," goes only so far: Is one 'located' in death or brokenness? Does a woman who is a professor 'exist' or 'take place' as a professor? In recent years these and other issues with early characterizations of Spanish BE by De Mello, Bolinger, and others have come to the fore, and more nuanced accounts have replaced this traditional view.

The consensus view today on Spanish BE (excepting the Mexican Spanish variety, which López-González, 2010 has argued is in a state of change) is that *ser* roughly maps onto IL predicates and *estar* onto SL predicates, following those early researchers. More nuanced accounts have added additional categories to these. For example, observing that the mapping into IL/SL contrasts only manifests a *preference* for one or the other verb, Maienborn

(2005) seeks to uncover any additional predictors of which verb will be selected, leading to a more exhaustive account. Her proposal revolves around the 'discourse-based distinctions' that are reflected in the selection of one or the other of the Spanish BE verbs, in which if information is new *to the person who produces a predicative utterance* then *estar* is an available option, representing as it does a 'new stage' in the speaker's world knowledge.

Such accounts bring to the fore the possibility of *coercing* a temporary reading out of a traditionally IL predicate: usually a person's height is described with *ser*, as in (22), but, for instance, if a child has grown since the last time the speaker saw her, the speaker can coerce a 'temporary' meaning of the adjective for *tall* using *estar*, as in (23).

(22) Mira que eres alta
Look that *ser*.2S tall
'Look, you're tall (, you'll be fine to go on the ride)'

(23) Mira que estás alta
Look that *estar*.2S tall
'Look, you've gotten tall (, my how you've grown)'

This level of subtlety could have two outcomes for children acquiring Spanish: it could either confuse them into overapplying *estar*, since many adjectives can be used flexibly with it—or it could draw their attention to the semantic contrast that *estar* represents, against *ser*. Let us now turn to an examination of the facts of monolingual development of BE in both Spanish and English, to determine whether the higher degree of lexical/semantic contrast in Spanish relative to English is a boon or a burden for children trying to acquire each language.

2.3 BE in acquisition

2.3.1 Acquisition of BE in English

From as early as Brown and Bellugi (1964) English-speaking children's difficulty with BE production has been an accepted fact of monolingual first language acquisition, followed on by Brown (1973) and much more recently by Hyams (1996) and Becker (2000). With this research progress has come a better understanding of the contexts in which English-speaking children omit BE, and of what the causes of those omissions might be.

An early study of Adam and Eve by Brown and Bellugi (1964) notes that 'deictic *that*' is frequently used with determiners and nouns, as in (24).

(24) a. That my cup
 b. That a horse
 c. That a blue flower

In each of these 'telegraphic' child utterances, what is absent is the 3rd person singular copula *is*. In some related utterances, Brown and Bellugi find, surprisingly, that Adam produces some utterances that flout the target word order, as in 'a your car' and 'a my pencil'. This suggests to the authors that within the young children's primitive noun phrase there may be a modifier position which always followed the article and preceded the noun—and so when utterances like those in (24) emerge, they can either be taken as evidence against this article-before-modifier theory, or as evidence for a different type of generalization, namely that the children are apt to omit the BE verb that they will ultimately place in the position between the demonstrative pronoun and the article.[7]

[7]So far as I can tell, the first of these conclusions has never been taken very seriously: as further data have

The attempt to interpret these double-determiner utterances is inconclusive, however, and misses an important generalization revealed by later research. Fast-forwarding to Becker (2000), the picture becomes a good deal more complex with the inclusion of more children's data and the observation that BE omissions, like the omissions of other functional items, are themselves less than random. In other words, while it is true that children's errors of omission are not random, given that they omit functional items more often than lexical items, even within the class of functional items children's productions can reflect structural distinctions.

Becker examines spontaneous production data from five of the monolingual English corpora available in CHILDES (including the same Adam who was analyzed by Brown and Bellugi), with the characteristics shown in Table 2.1.

child (source)	**file range**	**age range**	**MLU range (avg.)**	**# BE contexts**
Nina (Suppes, 1973)	7-13	2;0–2;2	2.79–3.43 (2.98)	471
Peter (Bloom, 1970)	6-11	2;0–2;3	2.26–3.33 (2.84)	785
Naomi (Sachs, 1983)	35-68	2;0–2;7	2.61–3.66 (3.08)	555
Adam (Brown, 1973)	10–28	2;7–3;4	2.23–4.12 (3.38)	792
Eve (Brown, 1973)	15–20	2;1–2;3	3.7–4.57 (4.03)	566

Table 2.1: Children examined in Becker (2000), including files, ages, MLU, and number of BE utterances per child (Becker, 2000, p. 85, Table 3.1)

This selection of files results in some 6500 utterances that are coded for the presence of BE or for its evident omission, in addition to those utterances that contain a lexical main verb, which Becker codes for finiteness. This last choice will become relevant to analyses presented later here. The author does not supply a global mean of the rate of overt BE for

been analyzed and more systematic omissions of BE by young children observed, such a hypothesis is naturally cast aside. However, the viewpoint expressed in this work, that it may look to an adult like the child omits BE even as she is really attempting to produce a modified noun, urges caution in subsequent interpretations of children's collected spontaneous speech.

the whole sample nor by child; the important result of the analyses is how the rate of overt BE varies with predicate type, that is whether it is a nominal (IL) or a locative (SL) predicate that the utterance contains. Those rates are reproduced in Figure 2.2.

	Nominals (IL)	**Locatives (SL)**
Nina	74.1 (143)	14 (115)
Peter	81.2 (401)	26.7 (90)
Naomi	98.7 (102)	38.1 (31)
Adam	44.4 (303)	4.9 (26)
Eve	39.8 (206)	54.8 (33)
% of overt BE	65.8	27.7

Table 2.2: Explicit BE by predicate types from Becker (2000); each entry formatted as *% over total (# of cases)* (p. 89, Table 3.3)

No statistical tests are performed on these data in Becker's dissertation, but the contrast between mean rates of overt BE use is striking enough even without a *p*-value beside it. For four of the five children, the rate of overt BE with nominal predicates is starkly higher than that found with locative predicates.[8] As representative of the remaining production patterns, Becker provides the examples reproduced in (25) and (26).

(25) Typical nominal predicatives:

a. de sun is lightning. (Adam 25)

b. he's a dog. (Nina 7)

c. Patsy's a girl. (Peter 11)

d. she's a crocodile. (Naomi 2;3)

(26) Typical locative predicatives:

[8] As can be seen in Figure 2.2,Eve displays the reverse pattern, and this finding together with other idiosyncrasies of her data leads Becker to exclude Eve from further analyses.

a. my pen *(is) down there. (Peter 6)

b. I *(am) in the kitchen. (Nina 10)

c. Eric *(is) at Cathy house. (Naomi 2;4)

d. he *(is) way up dere [there]. (Adam 20)

The utterances in (25) represent canonical individual-level predicative constructions, denoting the label or the inherent property of the subject, while the utterances in (26) are canonical stage-level predicative constructions, denoting very temporary properties of their subjects.[9] The important contrast is the presence of BE in the first set of examples and its absence in the second set. Further, having coded all main verbs in her corpus for finiteness, Becker discovers that nearly all of the tokens of overt BE are inflected for tense (mean percentage = 99.25%). What this final analysis suggests is that overt BE, having tense inflection, coincides with the projection of syntactic structure that tense requires: a TP.[10]

Explaining unbalanced English BE omissions

The explanation Becker (2004) gives for the imbalance of BE omission in her child data, discussed at greater length in her (2000) dissertation, makes use of the semantic/syntactic distinction discussed in section 2.2.1 involving on the one hand individual-level versus stage-level predicates and on the other hand structures lacking or containing an aspectual phrase. These constructs serve an explanatory function alongside several proposals

[9] Becker notes that the children do not produce any utterances that do not fall into these 'canonical' categories of nominal and locative predicates (e.g., event locations such as a party or inherent object locations such as an island). Those less canonically IL or SL predicates display crosslinguistic variation with respect to their mapping into BE morphemes, and so they might have provided some useful data on how to categorize such predicating structures.

[10] I will explore this relationship in much more detail in my analyses of the bilingual data.

relating to broader elements of language acquisition.

In Becker's account, the aspectual feature on the SL predicate gives rise to the projection of at least an AspP, just as in the target grammar. But she claims that the Tense operator (T_{OP}) in the C-domain, which anchors the utterance to the discourse and can only bind a T^0 node in adult English (Guéron and Hoekstra, 1995), is licensed by this more accommodating child grammar optionally to bind an Asp node instead. Thus a predicate that has an aspectual feature—an SL predicate, canonically, or a locative predicate—generates an Asp projection, which in turn potentially enters into a binding relation with T_{OP}, allowing the utterance to be anchored to the discourse (an alternative to which would be a derivational crash). But while the derivation does not crash, which is a positive outcome, the binding relation between the Asp projection and T_{OP} also means that no operator binds the node that typically houses overt inflection, i.e. finiteness, which leads to the utterance being produced without an overt reflection of finiteness. And in consequence, it lacks BE. The other option is that the Asp node does *not* bind that Tense operator, and so, instead, T_{OP} causes a TP to be projected *as well*, which allows the derivation to go through (just as it does in the adult grammar). The target Temporal Anchoring Constraint (TAC) that requires T_{OP} to bind T^0(and not optionally T^0 or Asp^0) is mastered over time and is eventually respected in all instances of outputs of the grammar.

This proposed TAC relies heavily on Wexler's 1998 account of the optional infinitive (OI) stage in many morphologically-impoverished languages, e.g., English or German. Wexler's account claims that another developmental constraint, the Unique Checking Constraint (UCC), is operative during children's OI stage, serving only to check off the [-

INTERPRETABLE] D-feature in a TNS projection or an AGR projection, but not in both (i.e., in the adult grammar the subject DP's D-feature can check multiply). In a process parallel to what we see with the TAC, where the grammar was less discerning than it ultimately needed to be, the UCC falls away with sufficient linguistic experience, allowing the grammar to be as discerning as it must, never touching either the principles or the parameters of UG.

The main obstacle to adopting the UCC and the TAC as a pair is that the former is a child-specific constraint—the former is (presumably) universally active in children and universally absent in adults.[11] Such a proposal conflicts with full competence and gradual structure-building hypotheses alike, and while it is compatible with maturational hypotheses, it is still difficult to understand why a child-specific constraint should exist at all. Why would the linguistic endowment be characterized by *extra* conditions, relative to the adult grammar, rather than by fewer, as someone who has been exposed to so little language perhaps should? Instead of attempting to answer these questions directly, I will supply an alternative account of the pattern of BE omissions in English, in §2.4 below, which strictly relies on universal constraints operating on both adult and child representations—but I first explore the corresponding patterns of BE development *in Spanish*, so that a comparison between the two languages can be made.

2.3.2 Acquisition of BE in monolingual Spanish

Not many studies have been conducted on patterns of omission of BE in Spanish, but Bel Gaya (2001) at least has claimed that virtually no BE omissions are ever found in Spanish-

[11] Because optionality is inherent to the constraint, the claim of universality to children should not be taken to imply that children always use root infinitives; instead, root infinitives (or corresponding tenseless defaults) should be available to *all* children at least *some* of the time.

acquiring children's speech, and more recently López-González (2010) and Holtheuer (2009) have supplied further analyses.[12] Importantly, the results that do exist each bear on a different dialect of Spanish, and there is reason to believe that these dialects contain differing target distributions of *ser* and *estar*. This section presents the details of the empirical findings on BE use in Spanish acquisition with a view toward understanding how BE usage becomes adult-like.

Iberian

The picture of BE development in Spanish is rather less clear than the parallel picture in English; it seems to me that the received wisdom that takes Spanish BE to be acquired without error (e.g., Liceras et al., 2010) is lacking an empirical basis. An examination of Bel Gaya (2001) concludes with an unsatisfying list of utterances in Catalan, and one in Spanish, from which BE has been omitted. Since it is probably safe to say that monolingual Catalan patterns will reflect the same learning mechanisms and tendencies as monolingual Spanish patterns will, given that the distribution of BE in Catalan is roughly parallel to that of (Iberian) Spanish (Brucart, 2012), I reproduce a selection examples including a line or two of discourse context that motivates the interpretation of the utterance absent BE—Catalan examples are in (27) and Spanish in (28).

(27) a. MAR: Oh, com menja!
oh, how eat.3SG
'Oh, how well she eats!'

[12] It is sometimes claimed in the literature (e.g., Liceras et al., 2010) that Sera (1992) also represents a claim of the absence of omissions of BE in child Spanish, but try as I might I cannot corroborate that interpretation in my reading of the paper. López-González (2010) takes a similar issue with the use to which Sera (1992) has been put and with some of the interpretive claims therein.

GIS: **Jo més gran.**
I *(am) more good

'I am even better'

b. NEN: Vull això.
want.3SG this

'I want this.'

GIS: **No teu.**
not *(is) yours

'It's not yours'

(28) a. CEC: ¿Esto es una niña?
this is a girl?

CEC: Mentiroso que es un perrito.
liar that it is a doggie

'You're a liar; it's a doggie'

EMI: **Esto una niña.**
this *(is) a girl

'This is a girl'

The rate of such omissions is not quantified in the volume, but Liceras et al. (2011) obtain via a personal communication the figures on the one Spanish and three Catalan children from Bel Gaya (2001) (see Table 2.3).[13]

[13]The results presented in Figure 2.3 reflect data from children in the following corpora of the following ages:

Child	Language	Data Source	Age range
Julia	Catalan	Bel (2001)	1;7.19–2;6.25
Pep	Catalan	Serra-Solé (CHILDES)	1;6.23–3;0.27
Gisela	Catalan	Serra-Solé (CHILDES)	1;7.14–3;0.29
María	Spanish	López-Ornat (CHILDES)	1;7–2;6
Emilio	Spanish	Vila (CHILDES)	1;8.13–2;11.24
Juan	Spanish	Linaza (CHILDES)	1;7.2–2;10.21

	ser		*estar*		**Total**		**Omission**
	Overt	Null	Overt	Null	Overt	Null	Ratio
Spanish	319	4	269	0	688	4	0.006%
Catalan	289	31	126	3	415	34	8%

Table 2.3: Rate of BE omissions from Bel Gaya (2001), as reported in Liceras et al. (2011)

The examples that are reproduced above, as well as the remaining ones supplied by Bel Gaya, are individual-level rather than stage-level predicates. That is, *ser* is occasionally omitted, while *estar* is not; the values in figure 2.3 confirm that the examples are representative of patterns in the corpora. This is the inverse of the pattern, described in §2.3.1, that Becker (2000) reports for English in that nominal predicates, which express inherent (or individual-level) properties (25), show higher rates of overt BE than do locative predicates, which express temporary (or stage-level) properties (26).[14] The percentage of Catalan omissions of *ser* located in Bel Gaya's corpora does not reach 10%, and so the omissions might be more plausibly construed as noise; however, running a Fisher's exact test comparing the omission rates of *ser* and *estar* in the Catalan data does produce a significant difference ($p < 0.01$). Again, the present study is interested in Spanish and not Catalan, so perhaps these results should be ignored altogether, but given the similarity of the BE paradigms in (Iberian) Spanish and in Catalan and the limited number of previous results available, they bear mentioning.

[14] Another report of Spanish monolingual acquisition of BE that claims the existence of omissions is made in Krasinski (2005). The author notes that her analysis of seven monolingual children whose data appear in Villamil Silvey (1983) demonstrates that the children omit BE at an early age just as English monolingual children do, but that when they do begin to produce BE they always use the appropriate verb, either *ser* or *estar*, depending on the context. (The ages of the children are not available.) In this claim of reliable target usage the Spanish monolingual children depart from the English monolinguals, who persist for up to a year longer in their production of utterances with omitted BE even once they do begin to produce some tokens of overt BE.

My own investigation of BE in the Spanish monolingual María from the Ornat corpus supplies more direct evidence about its acquisition in Iberian Spanish (Hsin, 2009). There I hand-coded the spontaneous productions of the child from age 1;7 to age 2;4 for all contexts in which BE was required, and it was revealed that errors fell into two classes: omissions of *ser* in contexts where it should have been overt, and misapplications of *estar* in contexts where *ser* or *haber*, the BE of 'existence', should have been used.

This pattern is unexpected on the basis of the aspectual distinction adopted by the majority of researchers who have provided analyses of Spanish BE (e.g., Luján, 1981; Lema, 1995), coupled with the developmental prediction made by Becker (2000). Those adjectival predicates that do not trigger an aspectual projection, i.e. those denoting permanent, non-eventive properties, apparently do not cause a crash of the derivation as Becker's analysis predicts. Instead, the aspectually empty *ser* is omitted in 27% of contexts in which it is required (42 of 157). In contrast, outside of the earliest two-month period, in which fixed phrases like *Nene aquí* 'child here' are uttered repeatedly and with BE omitted, *estar* is used in a target-like way throughout the corpus. The only exception to this target-like usage is the series or errors of commission, in which *estar* replaces *haber* in 'existential be' contexts, as in (29).

(29) a. CHI: no está pipas (Ornat: 1;10)
not ESTAR.3sg sunflower seeds
'There are no sunflower seeds'

b. CHI: no está caramelos (Ornat: 2;1)
not ESTAR.3sg candies
'There are no candies'

c. CHI: Estaba una niña mala guapa que se llama Mañina (Ornat: 2;3)
ESTAR.3sg.imp a girl bad pretty that SE calls Mañina
'There was an evil, pretty girl named Mañina'

The frequency of errors of omission, principally of *ser*, does not reach the level that is commonly attested in English acquisition, but it is above the level of noise, and the omissions do not arise in the expected part of the paradigm. There appears therefore to be an inconsistency between the Iberian Spanish pattern of omissions of BE and the English pattern: the developmental account in Becker (2000) that is supposed to predict BE development on the basis of feature-checking and structural availability does not chime with the evidence available from Iberian Spanish, a Spanish in the class of Spanishes with the most robust lexical contrast available for the two relevant predicate types. An important difference that my study of Spanish monolingual acquisition of BE has from the comparable English studies, as presented above, and Spanish-English bilingual studies, as I will detail below, is that the child is studied at a younger period (ending at 2;4)—which was done precisely because at that age she had ceased to produce any errors in BE use. While the breakdowns of omission *contexts* across these monolingual Iberian children, from Bel Gaya's study and from my own, are different, the overall rate of omissions, at least at the early stage, is comparable—and in fact, is comparably low.

Mexican

Mexican Spanish poses an interesting point of contrast to the Iberian Spanish pattern: while the aspectual distinction between predicate types is neatly mirrored in the distribution of *ser* and *estar* in Iberian Spanish, López-González (2010) has recently argued that the distribution of BE in Mexican Spanish is in a state of change, such that *estar* occupies a larger subset of BE contexts in that variety of Spanish than it does in Iberian. Robust evidence for this shift is found in experimental data collected with both adults and children, who accept *estar* as the verb of choice even when story contexts contain an atemporal predicate. However, both of the author's experiments are forced-choice comprehension tasks and thus do not admit of the possibility of omissions. They do demonstrate that the changing patterns observable in adult Mexican Spanish are being passed down to children (and so can be inferred to be present in child-directed speech). We will return later to whether these facts pose an issue for generating predictions of cross-linguistic influence between Spanish and English when the variety of Spanish spoken is Mexican.

López-González (2010) also analyzes the spontaneous speech of a child being raised in Mexico by an Argentinian mother and an American father, which does not bear on the characteristics of Mexican child-directed speech but does arguably illustrate the acquisition of Mexican Spanish, given the child's experience with several neighborhood Mexican-Spanish-speakers (including a caretaker and several older children). López-González focuses on the distribution of the two Spanish BES in this corpus and argues convincingly that the function of *estar* has expanded in the Mexican lexicon to take on some of the functions that *ser* performs in more traditional Iberian Spanish. However, this innovation shows no sign of influencing the generally masterful development of Spanish BE: the author reports that Koki produces zero errors in all of the analyzed corpus, from 1;11.25 to 2;9.14.

Chilean

There is no claim that Chilean Spanish BE is undergoing the kind of distributional shift that Mexican Spanish is, and so in the following series of observations it is the typical adult Iberian pattern that is used as a point of comparison. In one study of the acquisition of BE in Chilean Spanish, Schmitt et al. (2004) conduct an experiment to test whether children are sensitive to the pragmatic implicatures that can coerce the use of *ser* or *estar* even with an adjective that is canonically associated with the other verb. In this picture-matching task, children with a mean age of 4;5 selected a picture displaying the permanent property of an entity more often in response to questions containing *ser* and to questions containing *estar* as well, indicating a lack of sensitivity to the pragmatic constraints of the story (or an inability to map their accurate pragmatic knowledge into the appropriate BE verb.

In two additional tasks run by Schmitt et al., both acceptability judgment tasks, children seem first to display a "yes"-bias, and given the nature of the target items in the studies, this leads to what appears to be a troublingly random pattern of results: in the picture-matching task, no difference between *ser* and *estar*; in the first acceptability task, proximity to adult-like performance with *ser* but not with *estar*; and in the second acceptability task, proximity to adult-like performance with *estar* but not with *ser*. However, when the researchers look only at "no" responses in the last of these tasks, they find a clear difference between children's willingness to reject *ser* where it does not belong and their willingness to reject *estar*—and children are far likelier to reject *ser* than *estar*, which demonstrates a greater willingness to 'overuse' *estar*.

Schmitt et al. interpret these results as indicative of children's tendency to overuse "the representation that is true in the smallest set of circumstances" (cf. Crain and Thornton, 1998), but it is also consistent with the picture that López-González (2010) presents of Mexican Spanish. Given some of the other commonalities among Latin-American Spanishes, it is possible that, rather than reflecting the developmental strategy that Crain and Thornton propose, Chilean children overuse *estar* because in their dialect, too, its use is becoming more extensive in the contemporary spoken language.

Holtheuer (2009) investigates the use of BE in the Spanish of monolingual Chilean speakers, both adults and children. In spontaneous speech samples collected from eleven Chilean children (age range: 1;10–3;7), Holtheuer identifies 334 contexts that require *ser* and 331 that require *estar*. She finds 29 omissions of *ser* and 32 omissions of *estar*; 10.6% of *ser* contexts are produced with that verb omitted, while 14.3% of *estar* contexts are missing their verb (the omission rates of the two BE verbs in this case are not statistically different from one another). In contrast to the findings of previous corpus and comprehension studies of Spanish BE, this analysis additionally uncovers an overuse of *ser* with prepositional predicates (rather than the more usually found overextension of *estar* with the same class of predicates). However, for a given adjective the correct BE verb is consistently selected. Most importantly here, Holtheuer's study of a large corpus of spontaneous child speech does not display an overuse of *estar*, which I just offered as a possible alternative explanation for the Schmitt et al. (2004) results. Therefore we lack evidence for an extension of *estar* usages in Chilean Spanish, just as we do for Iberian Spanish. Mexican Spanish appears to be the outlier in this respect.

Thus after surveying all the available research on the development of BE in a variety of Spanishes—Iberian, Mexican, and Chilean—we are left with a range of omission patterns, but it is a small range. Omission rates never exceed 15% in the case of any child after age 2, which poses a striking contrast to the much higher rates found in monolingual English acquisition (around 50% between age 2 and 3). In the studies of bilingualism development of TBE that I present later, I draw comparisons to this *broad* pattern, in which omissions of BE in Spanish are few (few enough that they probably reflect individual variation for which we have too little data to offer a generalizable explanation) and omissions of English many. Because the corpora on monolingual English are larger than those on monolingual Spanish and because the patterns of omission/inclusion of BE are more robust, in the next section I supply the promised alternative explanation of the *English* patterns of BE omission in the terms of Optimality Theory—the same terms of my theoretical account of bilingual production phenomena that are the focus of this chapter.

An alternative explanation from Optimality Theory

In the next section I will reanalyze BE omission data along the lines of Davidson and Legendre (2003)'s account of non-finite root forms in early child French and Catalan, in which multiple layers of functional projections compete to be realized in a context of limited representational capacity. In their data on Catalan and French acquisition, Davidson and Legendre find that children have a variable ability to produce utterances that are specified for both tense and agreement (in contexts where an adult's utterance would specify both). Moving from one developmental stage to the next, the children produce agreeing verbs that are not tensed, or tensed verbs that are not agreeing, as in (2.4), before converging on the target grammar.[15]

Missing feature	Resulting surface form and features
T and AGR	menjar/menjat/menja (eat-INFIN./PARTIC./3S-PI)
AGR only	ha menjat (eat-3S, past)
T only	menjo (eat-1S, present)
Neither (i.e., target)	he menjat (eat-1S, past)

Table 2.4: Possible manifestations of past tense 1S verbal inflection in Catalan

The authors argue that this optionality is due to the 'floating' of constraints that *encourage* the expression of inflectional features like tense and agreement around other constraints, whose ranking is set, which *penalize* the presence of functional structure—thereby creating a tension that the grammar must resolve with further attempts at production. Constraint floating allows one constraint not to be crucially ranked with respect to another; for every production, the floating constraint settles down into a position relative to a fixed constraint, and depending on what *side* of the fixed constraint the floating one lands on, the output candidate may differ.

In the sense that their account explains why children produce utterances that seem more tolerant of flexible or incomplete feature-checking, Davidson and Legendre (2003)'s proposal is parallel to Wexler (1998)'s. But in another sense the two accounts are orthogonal to one another: the OT proposal captures children's errant productions using only components of adult grammar—suitably arranged—while the UCC (and similarly the TAC) proposal leans on a child-specific constraint to explain the difference between child and adult productions. The OT proposal therefore represents a more parsimonious theoreti-

[15] As described in footnote 3, it is acceptable in the case of the phenomena central to this discussion to subsume AgrP within TP. In what follows, I mention AgrP where it has been the focus of previous research but do not incorporate it into my own analyses.

cal proposal, as well as one that is in line with the gradual structure-building hypothesis, two sources of its appeal. Moreover, it is flexible enough to accommodate cross-linguistic variation (cf. the analyses of non-finite root forms in Catalan vs. French in Davidson and Legendre, 2003, and Legendre et al., 2002, respectively).

A final, general source of the appeal of OT in accounting for optionality in child language and for passage through developmental stages is discussed in the next section, where I extend this proposal to the case of BE omission in English monolinguals, laying the foundations of my ultimate account of cross-linguistic influence in bilingualism.

2.4 Optimality Theory in acquisition

Optimality-Theoretic syntax (Legendre et al., 2001; Grimshaw, 1997) follows OT phonology (Prince and Smolensky, 2004) in being a formal theory with no substantive commitments as to the nature of the representations involved in language production and comprehension. The theory consists of several hypotheses concerning the nature of grammatical knowledge and learning (Legendre et al., 2001, p. 3), and its most distinctive characteristic is that it takes the constraints of grammar to be *violable*—even by the representations underlying the target forms of a language. OT maps inputs, in syntax typically taken to have traditional predicate-argument (sentential logic) structure, to output candidates, which reflect different structural alternatives to realize the input. The Generator, *Gen*, uses the input to produce the output candidates and in so doing respects whatever *inviolable* principles the theoretician believes operate universally upon language (e.g., binary branching only). While the parameters of Principles and Parameters theory (PandP: Chomsky, 1981) are either 'on' or 'off', which predicts that the systematicity of phenomenon in a given language is complete, in OT a constraint that is always satisfied (or always violated) in a given language does not have a special status relative to another constraint that is sometimes satisfied and sometimes violated. All constraints are in principle violable, and so in turn, crucially, a principle that cannot be taken as inviolable in a language can nonetheless be operative in that language.

While a diverse collection of approaches could in principle be employed in service of an account of language acquisition, Optimality Theory is the ideal tool for two main reasons. One, it provides a straightforward, *formal* depiction of the differences in the grammars of the languages being compared, which means that their relationship can also be depicted straightforwardly. But this would be true of other formal approaches as well, including any in the Government and Binding/Principles and Parameters/Minimalist traditions. What sets OT apart is the way in which the *acquisition* process itself is supplied with a formal basis (e.g. Legendre et al., 2002, as discussed in Section 2.3.2). Given that many constuctions are acquired gradually in first-language acquisition—rather than there being a period of no use (or 100% incorrect use) and then a jump to consistent target usages—the theoretical account should reflect that slow course of development. It is true that the facilitation that can be observed in bilingualism is manifested in mostly reliable target-like productions, but the monolingual analogs display more gradual development. In order to demonstrate the basis of this contrast, we need a theory that can accommodate both types of growth of grammatical knowledge.

2.4.1 English BE development in OT

Section 2.3.1 showed that BE omissions are common in English monolingual acquisition, and yet they are not uniform across contexts. When the predicate that calls up BE has an aspectual feature—is only indicative of a stage in time—BE is likelier to be omitted than when it does not. As discussed above, Becker (2000) has argued that this is due to the fact that the utterance must be anchored to the discourse, and that children 'allow' this anchoring to take place when *either* tense *or* aspect has been realized.

Building on Davidson and Legendre (2003) (and more indirectly on Legendre et al., 2004), I propose to account for this contrast on the basis of limited availability of functional projections, rather than on a laxer application of an adult constraint (see §2.3.1 for arguments). In developing this account, I select two inputs to my optimizations, one representing a stage-level (SL) predicate and one representing an individual-level (IL) predicate. I then derive from each of these inputs the several structural realizations that could correspond to them (completing the function of *Gen*), and finally describe the set of constraints that are operative in the evaluation of those candidates.

Input, candidates, and constraints

Input Two related predicates will be used in the sample optimizations throughout this chapter: 'be sick' and 'be sickly'. Aside from the morphology on the second adjective, the predicates have a more important difference—'being sick' is a temporary affliction, an SL predicate, while 'being sickly' is an ongoing, permanent affliction, an IL predicate. Two inputs with traditional propositional structure will represent these predicates (along with an arbitrary subject), as shown in (30).[16]

(30) a. <sick(x), (x=Lou), ASP=perf, T=pres> *target:* Lou is sick

b. <sickly(x), (x=Lou), T=pres> *target:* Lou is sickly

The difference between the two predicates is that the SL predicate, in (30a), specifies the aspectual feature, 'perfective', meaning that Lou "is in the class of individuals bearing the property [sick] at a delimited period of time whose beginning and end are both known or assumed or at least one of them is" (Luján, 1981, p. 176). This is in contrast to the input in (30b), which is not specific for aspect. Monolingual English children, as we have seen, tend to omit BE more often in the presence of the [+ perfective] feature than in its absence, for reasons that will be formalized in the upcoming sections; we have already seen a hint of what these reasons are, given the relatively large structure proposed to underlie SL utterances (Fig. 2.2), the relatively small one underlying IL utterances (Fig. 2.3).

Constraints Five universal constraints are operative here. Three of these are FAITHFULNESS constraints, which are violated when a feature that is present in the input is not reflected in one of its generated candidates, or when a feature that is present in a candidate does not correspond to a feature of the input. The other two are MARKEDNESS constraints, also specifically called ECONOMY constraints, which are violated in the presence of, in the most general terms, various syntactic objects (structure, heads, movement, etc.). Since the representation of a feature within the syntactic structure requires the existence of a position that can house that feature, these two sets of constraints work against one another. When

[16]The abbreviations 'asp', 'perf', and 'pres' stand for *aspect*, *perfective*, and *present*, respectively. A full list of such abbreviations is found in the front matter, under *List of Abbreviations*.

a FAITHFULNESS constraint is satisfied, it is likely that some MARKEDNESS constraint will be violated, and vice versa.

(31) The FAITHFULNESS constraints

a. Parse Tense: PARSET (Based on Legendre et al., 2002)

—*The tense feature on the verb/in the proposition is parsed.*

Satisfied whenever finiteness is realized either via verb-raising or affix-lowering (i.e., in the presence of a TP). Violated otherwise.

b. Parse Aspect: PARSEASP (Based on Legendre et al., 2004)

—*The aspectual feature on the verb/in the proposition is parsed.*

Satisfied whenever the aspectual feature of an input is realized structurally and, if available in the language, lexically (i.e., in the presence of an ASPP in English and Spanish, but only with the additional imposition of the *estar* SL BE in Spanish). Violated otherwise. (Note: PARSEASP is vacuously satisfied when there is no aspectual feature in the input, as will be the case for IL predicates.)

c. Fill Copula: FILL_{COP} (Based on Grimshaw, 1997, FULL-INT)

—*Pure copulas are absent.*

Satisfied whenever each input element maps to one of the elements of the candidate. Violated whenever a candidate has a copular element that only checks a tense feature.

The PARSE constraints require no further elaboration beyond the exposition that I will shortly give of the way that they interact with candidates. But FILL_{COP} bears a bit of discussion. So far as I am aware, no one has previously set out to give an OT account of BE, and the IL copula that has no semantics is not traditionally spoken of in the same breath as the 'dummy do' of *What **does** the fox say?* or the expletive subject of ***It**'s raining cats and dogs!* (but see Moro, 1991, for one exception). Nevertheless, while there are several different ways that a predicate adjective or noun phrase can relate to its subject (e.g., with an attributive as opposed to a specificational function: Mikkelsen, 2005), it is not foregone that BE itself is responsible for those differences; in fact, as De Mello and Bolinger (1980) wrote of the "meaningless copula *ser*", so too can we understand the English copula (a term which, the reader will recall, is being reserved for the IL usage of BE). And if this is an appropriate interpretation, then its insertion can be traced back to the need to satisfy a higher-ranked constraint—say, PARSET—just as the other expletive *do* does. Yet as the IL BE does not correspond to any semantic component of the input, then it exists in violation of a FAITHFULNESS constraint, and the subfamily of FAITHFULNESS constraints that is violated by extraneous material *within a candidate* is the FILL family.[17]

(32) The ECONOMY constraints

a. *Functional Projections: *F (Legendre et al., 2004)

—*Functional projections are absent.*

Satisfied whenever the structure does not project beyond VP. Violated when the structure contains a single functional projection (e.g., TP or ASPP).

b. *Two Functional Projections: *F^2 (Legendre et al., 2004)

—*Pairs of functional projections are absent.*

Satisfied whenever the structure does not project beyond VP. Violated when the

[17] FILL$_{COP}$ may seem like a 'brute force' addition to the universal collection of constraints, but because of the peculiar behavior of BE across languages of the world, in which BE's presence/absence has rather unique but broad-based ramifications throughout the clause, a constraint that rules an overt BE in or out seems appropriate.

structure contains two functional projections (e.g., both TP and AspP).[18]

It is important to note that $*F^2$ is an instance of 'local conjunction' of two *F constraints, resulting in a Power Hierarchy (see Smolensky, 1995)—it simply indicates that *F is violated twice by a candidate. A violation of $*F^2$ entails two violations of *F. And while the Faithfulness constraints are not universally ranked with respect to one another, these two Markedness constraints are, $*F^2$ always outranking *F; if a candidate violates $*F^2$, then it also violates *F, twice.

Candidates I consider a limited number of candidates for these inputs, reflecting the attested and possible patterns (and their underlying structures) for each. As we will see, both the candidates and their constraint violations differ, considering that the mapping from the input to the target candidate differs depending upon what features are present in the input.

The two candidates in competition to realize the IL input, e.g., *sickly*, are shown in Figures 2.4 and 2.5.

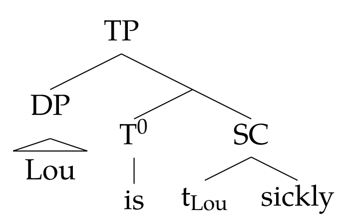


Figure 2.4: (a) $[_{TP}$ Lou is $[_{SC}$ t_{Lou} sickly]] (IL)

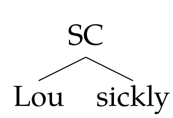


Figure 2.5: (b) $[_{SC}$ Lou sickly] (IL)

[18] My $*F^2$ corresponds to $*F^3$ in Legendre et al. (2004), because their $*F^2$ goes to penalize an AspP projection, and then $*F^3$ penalizes a CP. The effect, however, is the same regardless, again because any violation of $*F^n$ entails a violation of $*F^{n-1}$.

While it is possible to produce a tenseless small clause, as in Figure 2.5, with no functional projections whatever, it is advantageous to the production of the target IL structure (in Figure 2.4) that only one functional projection (TP) is needed.

In the case of the SL predicate, e.g., *sick*, since there is an additional feature [asp] specified in the input, four crucial candidates are generated from it rather than the two corresponding to the previous input. The target structure for the SL predicate is shown in Figure 2.6; it has two functional projections, one that permits the parsing of tense (TP) and one that permits the parsing of aspect AspP.

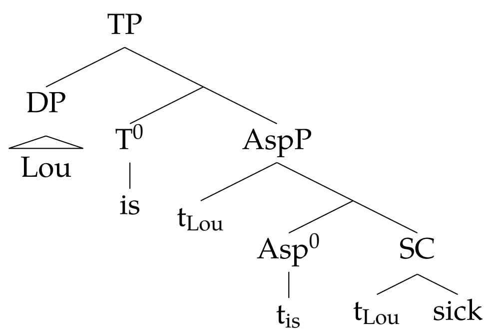


Figure 2.6: (a) $[_{TP}$ Lou is $[_{AspP}$ t_{lou} $e_{[+Asp]}$ $[_{SC}$ t_{Lou} sick]]] (SL)

If instead only one functional projection were generated and that projection were AspP rather than TP, then BE, which in English is overt merely as a reflection of tense, would be omitted, as in Figure 2.7.

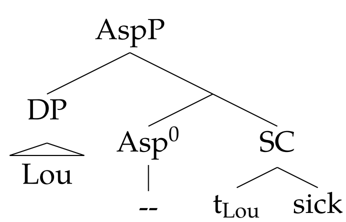


Figure 2.7: (b) $[_{AspP}$ Lou -- $[_{SC}$ t_{Lou} sick]]] (SL)

If that one functional projection were instead the TP, then BE would surface—reflecting the tense feature that is made available in the presence of the TP—but the aspectual feature from the input would not be parsed. On the surface, then, the candidate represented in Figure 2.8 looks like the target, but it does not in fact parse all of the features of the input in the case of an SL predicate.

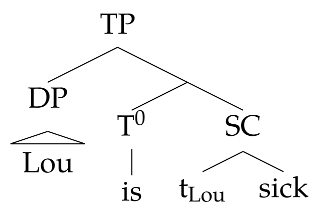


Figure 2.8: (c) [$_{\text{TP}}$ Lou is [$_{\text{SC}}$ t$_{\text{Lou}}$ sick]] (SL)

Finally, the same small clause is available for the SL input as it is for the IL input, and in this case it will incur even more violations than the IL input's corresponding SC candidate did, because *two* specified input features (tense and aspect) fail to be parsed, rather than one.

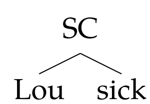


Figure 2.9: (d) [$_{\text{SC}}$ Lou sick] (SL)

In addition to the candidates that I have introduced here, there are in principle an infinite number of alternatives; assuming that *Gen* is only restricted by X'-theoretic demands, given just the simple inputs considered here the system can generate structures that have, e.g., three, four, five projections; any number of expletives; multiple series of movement operations; empty heads; and so forth. What restricts the number of candidates that need to be considered for a particular optimization is that some candidates are *harmonically bounded* by simpler ones: they incur more violations of higher-ranked constraints than some alternatives do, so they can never win, and thus are not viable competitors and need not be considered (Prince and Smolensky, 2004). For the sake of completeness, however, I list the harmonically bounded candidates in (33) and (34).[19] Where candidates would be ruled out by constraints that are not otherwise germane to this chapter, I describe their violations in general terms rather than appealing to specific constraints whose introduction will not occur until Chapter 3.

(33) *Harmonically bounded candidates corresponding to IL input*

a. [$_{\text{AspP}}$ Lou be [$_{\text{SC}}$ t$_{\text{Lou}}$ sickly]] —*violates* ParseT *and* Fill$_{\text{COP}}$

b. [$_{\text{TP}}$ Lou is [$_{\text{AspP}}$ t$_{\text{Lou}}$ -- [$_{\text{SC}}$ t$_{\text{Lou}}$ sickly]]] —*violates* Fill$_{\text{COP}}$; **F^2 (and *F twice)*

(34) *Harmonically bounded candidates corresponding to SL input*

a. [$_{\text{AspP}}$ Lou be [$_{\text{SC}}$ t$_{\text{Lou}}$ sick]] —*violates* ParseT *and* Fill$_{\text{COP}}$

b. [$_{\text{TP}}$ Lou -- [$_{\text{SC}}$ t$_{\text{Lou}}$ sick]] —*violates* ParseT *and* ParseAsp

The final list of retained candidates is given in (35) and (36) for IL and SL predicates, respectively.

(35) a. [$_{\text{TP}}$ Lou is [$_{\text{SC}}$ t$_{\text{Lou}}$ sickly]]

b. [$_{\text{SC}}$ Lou sickly]

(36) a. [$_{\text{TP}}$ Lou is [$_{\text{AspP}}$ t$_{\text{lou}}$ $e_{\text{[+Asp]}}$ [$_{\text{SC}}$ t$_{\text{Lou}}$ sick]]]

b. [$_{\text{AspP}}$ Lou -- [$_{\text{SC}}$ t$_{\text{Lou}}$ sick]]]

c. [$_{\text{TP}}$ Lou is [$_{\text{SC}}$ t$_{\text{Lou}}$ sick]]

[19]The procedure for determining which candidates are true competitors and which are harmonically bounded crucially involves evaluating possible candidates *against constraints*. But given how simple the inputs to these optimizations are, I set the elaboration of procedure aside in this chapter and return to it in the next, when more complex inputs and a larger set of constraints come into play.

d. [$_{SC}$ Lou sick]

Now that the constraint set is constructed, it is possible to determine in what ranking scenarios various candidates will be the optimal outputs, providing an explanation for the disparity between English monolingual child and adult predicative utterances involving BE. The adult target optimization is given below in Tableau 2.8, while the child optimization is in Tableau 2.6.

Optionality based on limited structure

The key interaction between the FAITHFULNESS constraints and the MARKEDNESS constraints is that *F constraints prohibit both PARSET and PARSEASP constraints from being satisfied simultaneously: either TP or ASPP can be present, but not both, when $*F^2$ outranks one of them. Below I will account for the optionality surrounding omission or inclusion of BE, but I first present the categorical case. It will be noted, too, that FILL_{COP} is omitted from these English tableaux; its effect is redundant with other constraints for both the IL and the SL optimizations, so while it was important to include that constraint for purposes of harmonic bounding, it is evident that FILL_{COP} is ranked low enough to be irrelevant to the outcomes below.[20]

In Tableau 2.5, an input that is not specified for aspect will be mapped to the target adult output, even though the ranking, PARSEASP $\gg$ $*F^2$ $\gg$ ParseT $\gg$ *F, places a key FAITHFULNESS constraint, PARSET, below a key MARKEDNESS constraint, $*F^2$. Only one layer of functional structure is needed to realize the only verbal feature in the input numeration.[21]

[20] In footnotes to each optimization I mention why the effect of FILL_{COP} is muted in that particular case.

[21] Here FILL_{COP} is not relevant because, while it is violated by the winning candidate, it is ranked below other constraints—crucially PARSET—violations of which are fatal to the non-optimal candidate.

<sickly(x), (x=Lou), T=pres>	PARSEASP	*F^2	PARSET	*F
☞ a. [$_{TP}$ Lou is [$_{SC}$ t$_{Lou}$ sickly]]				⊛
b. [$_{SC}$ Lou sickly]			*!	

Table 2.5: Child optimization for 'Lou is sickly' (IL)

In contrast, in Tableau 2.6, when an input specified for aspect meets the same constraint ranking, the null-BE candidate wins out—because while it does not manage to parse the tense feature, it is structurally economical and does parse the aspectual feature.[22]

<sick(x), (x=Lou), T=pres, ASP=perf	PARSEASP	*F^2	PARSET	*F
a. [$_{TP}$ Lou is [$_{AspP}$ t$_{lou}$ $e_{[+Asp]}$ [$_{SC}$ t$_{Lou}$ sick]]]		*!		**
☞ b. [$_{AspP}$ Lou -- [$_{SC}$ t$_{Lou}$ sick]]]			⊛	⊛
c. [$_{TP}$ Lou is [$_{SC}$ t$_{Lou}$ sick]]	*!			*
d. [$_{SC}$ Lou sick]	*!		*	

Table 2.6: Child optimization for 'Lou is sick' (SL)

The preceding rankings are an abstraction away from the reality of children's productions, however; as far as I am aware no child entertains the set ranking in which *F^2 uniformly outranks PARSET, *never* producing BE in the presence of an aspectually-inflected predicate. Instead, there is *optionality* in children's utterances, and to capture this I employ

[22]In this tableau FILL$_{COP}$ is vacuously satisfied. With its low ranking and with the fact that it is *not* violated by the winner, each competitor to the optimal candidate gets ruled out by high-ranked constraints—higher than the *F^2 and PARSEASP that candidates (a) on the one hand, and (c) and (d) on the other, violate.

the notion of partial constraint rankings (cf. Legendre et al., 2002). With partial rankings, the FAITHFULNESS constraints are free to float about the MARKEDNESS constraints, giving rise alternately to target-like and non-target-like productions.

The difference between monolingual English-acquiring children's tendency to use a null BE in the IL vs. the SL contexts varies, so I elect here to model just two examples from Becker (2000)'s data.

Monolingual English: Naomi Becker codes Naomi's files, from the Sachs corpus (Sachs, 1983), from age 2;0 to age 2;7, and finds that in this range Naomi uses overt BE with IL adjectives 93.5% of the time but with SL adjectives only 52% of the time. Thus while her utterances with IL adjectives are nearly adult-like (i.e., within an acceptable margin of error), the SL adjectives' BE is included only about half the time. This means that Naomi has a partial ranking in which only PARSET floats around $*F^2$—at this developmental stage of the child's grammar PARSEASP has already settled above $*F^2$.

(37) *Floating constraints: Naomi's IL and SL* be *patterns*

Fixed:	PARSEASP ≫		$*F^2$	≫	*F
Floating:		PARSET	________		

All rankings are presumed to be equiprobable, following Legendre et al. (2002), and so the distribution of errors and target-like utterances in the child's productions should map approximately to the proportion of times each partial ranking might be adopted, assuming no bias toward one or the other. This is exactly what is captured in the partial ranking in (37), as the optimization shorthands in (38) and (39) show. Approximately 50% of the time, SL aspectual BE should be omitted, while an IL copula should virtually never be. Note that both rankings yield the same output for the IL input, in (38), but different outputs for the SL input, in (39).

(38) *IL input*

a. PARSEASP ≫ PARSET ≫ *F^2 ≫ *F yields: [$_{TP}$ Lou is [$_{SC}$ t$_{Lou}$ sickly]]

b. PARSEASP ≫ *F^2 ≫ PARSET ≫ *F yields: [$_{TP}$ Lou is [$_{SC}$ t$_{Lou}$ sickly]]

(39) *SL input*

a. PARSEASP ≫ PARSET ≫ *F^2 ≫ *F yields: [$_{TP}$ Lou is [$_{AspP}$ t$_{lou}$ $e_{[+ASP]}$ [$_{SC}$ t$_{Lou}$ sick]]]

b. PARSEASP ≫ *F^2 ≫ PARSET ≫ *F yields: [$_{AspP}$ Lou -- [$_{SC}$ t$_{Lou}$ sick]]]

Naomi's BE data are therefore neatly captured with a partial ranking involving the floating of only one FAITHFULNESS constraint.[23] Furthermore, the system allows for individual variation as illustrated next, with the production patterns of another monolingual English-speaking child.

Monolingual English: Peter In contrast to Naomi's data, neither IL or SL adjectives are immune from BE omission in Peter's files from 2;0 to 2;3 (from the corpus of Bloom, 1970). He produces 60% of his IL adjectives with an overt copula, and 39.8% of his SL adjectives with overt BE. This indicates that the range of floating of the FAITHFULNESS constraints is greater in Peter's grammar than it is in Naomi's—with the consequence that he produces

[23]Incorporating the 6.5% of erroneous IL productions would necessitate the adoption of constraint *weightings*, since such a low percentage of errors is unlikely to follow from the inclusion of other constraints that are not being discussed here. (Given equiprobability of partial rankings and unweighted constraints, however, extra constraints would be the only source of such optionality—unless modifications to the *input* were posited, as an even more drastic approach.) The establishment of these weightings, e.g. an extension into the terms of Harmonic Grammar (Legendre et al., 1990), is beyond the scope of this dissertation, but for a discussion of the virtues of weighted constraints see, e.g., Pater (2009).

more non-target utterances than she does.[24]

(40) *Floating constraints: Peter's IL and SL* be *patterns*

Fixed: $*F^2 \gg *F$

Floating: ParseT ________________

ParseAsp ________________

Because there are two constraints floating among three different positions *each*, and because neither of the floating constraints is crucially ranked with respect to the other, there are in total 12 possible rankings: $*F^2$ always outranks *F, but otherwise there are 4 permutations of the three positions (i.e., $\frac{4 \cdot 3 \cdot 2}{2} = 12$). In (41) I present the fixed rankings derived from the partial ranking of Parse constraints portrayed in (40), roughly in order of most- to least-adult-like.

(41) a. ParseT ≫ ParseAsp ≫ $*F^2$ ≫ *F yields *overt* w/ IL, and *overt* w/ SL

b. ParseAsp ≫ ParseT ≫ $*F^2$ ≫ *F yields *overt* w/ IL, and *overt* w/ SL

c. ParseT ≫ $*F^2$ ≫ ParseAsp ≫ *F yields *overt* w/ IL, and *overt* w/ SL

d. ParseAsp ≫ $*F^2$ ≫ ParseT ≫ *F yields *overt* w/ IL, and **omission** w/ SL

e. ParseT ≫ $*F^2$ ≫ *F ≫ ParseAsp yields *overt* w/ IL, and *overt* w/ SL

f. $*F^2$ ≫ ParseT ≫ ParseAsp ≫ *F yields *overt* w/ IL, and *overt* w/ SL

g. $*F^2$ ≫ ParseAsp ≫ ParseT ≫ *F yields *overt* w/ IL, and **omission** w/ SL

h. $*F^2$ ≫ ParseT ≫ *F ≫ ParseAsp yields *overt* w/ IL, and *overt* w/ SL

i. ParseAsp ≫ $*F^2$ ≫ *F ≫ ParseT yields **omission** w/ IL, and **omission** w/ SL

[24] A similar strategy of proposing different partial rankings for different children at the same independently established stage of development was previously employed by Legendre et al. (2004) on the acquisition of aspect in Mandarin.

j. $*F^2 \gg$ ParseAsp $\gg *F \gg$ ParseT yields **omission** w/ IL, and **omission** w/ SL

k. $*F^2 \gg *F \gg$ ParseT $\gg$ ParseAsp yields **omission** w/ IL, and **omission** w/ SL

l. $*F^2 \gg *F \gg$ ParseAsp $\gg$ ParseT yields **omission** w/ IL, and **omission** w/ SL

If these 12 rankings were possibilities (and, again, equiprobable ones), then we would expect to find 66% of IL predicates with overt BE, and 50% of SL predicates with overt BE. Both of Peter's rates of BE inclusion are lower than these theoretical probabilities, but in the right direction. We can refine the account further by finding a categorical way of ruling out two of the partial rankings in (41) that yield correct productions for each of the predicate types.

There is a straightforward way of doing this, given the proposal that in the initial state of the grammar Economy (Markedness) constraints outrank Faithfulness constraints (Smolensky, 1996).[25] As arriving at the adult ranking is a matter of achieving the demotion of the Economy constraints beneath the Faithfulness constraints, it can be claimed that in the present stage of Peter's grammar only *one* Faithfulness constraint can occupy a position above the more stringent of the two Economy constraints ($*F^2$). Thus while ParseT and ParseAsp may float freely about each other and about *F and $*F^2$, *both* cannot at this point in Peter's grammatical development outrank both *F and $*F^2$. With this, we can rule out (41a) and (41b), and arrive at the just the target probabilities, reflected by the set of rankings in (41c–41l): 60% copula inclusion with IL predicates and (approximately) 40% BE inclusion with SL predicates.

[25] I will go into more detail on the issue of the initial state in the third chapter, on the building up of more structure still.

Arriving at the English target

Once the process of entertaining partial rankings is complete and the child has converged on the adult ranking, her grammar will reliably carry out the following optimizations:[26]

<sickly(x), (x=Lou), T=pres>	PARSEASP	PARSET	*F^2	*F	FILL$_{COP}$
☞ a. [$_{TP}$ Lou is [$_{SC}$ t$_{Lou}$ sickly]]				⊛	⊛
b. [$_{SC}$ Lou sickly]		*!			

Table 2.7: Adult optimization for 'Lou is sickly' (IL)

<sick(x), (x=Lou), T=pres, ASP=perf	PARSEASP	PARSET	*F^2	*F	FILL$_{COP}$
☞ a. [$_{TP}$ Lou is [$_{AspP}$ t$_{lou}$ $e_{[+Asp]}$ [$_{SC}$ t$_{Lou}$ sick]]]			⊛	⊛⊛	⊛
b. [$_{AspP}$ Lou -- [$_{SC}$ t$_{Lou}$ sick]]]		*!		*	
c. [$_{TP}$ Lou is [$_{SC}$ t$_{Lou}$ sick]]	*!			*	*
d. [$_{SC}$ Lou sick]	*!	*			

Table 2.8: Adult optimization for 'Lou is sick' (SL)

It is this ranking that English monolingual adults possess, just as it is for Spanish monolingual adults—and children—whose grammars value maintaining faithfulness to the input over concerns of structural economy. Now, whether the input has features that require one layer of functional structure to be projected or two, the grammar can handle that input and

[26]It should be noted that other constraints are violated by the winners (and losers) in these tableaux, including STAY, which will be important in the next chapter. But because no other constraints are decisive here, I maintain the streamlined nature of presentation and consider only the five presented above.

select the target output accurately.

2.4.2 The parallel Spanish target

Given that the constraints in OT are universal, the same ones that were just used for English are operative in Spanish as well. While cross-linguistic variation is captured by the relative rankings of different constraints, between Spanish and English the structures that predicative sentences require are identical, and so, too, are their rankings to a large extent. However, in order to tackle the Spanish optimization of IL and SL propositions, we need to include components that will deal appropriately with the lexical contrast that those types of predicates entail: *ser* for IL predicates and *estar* for SL predicates. I therefore return to the matter of the constraints and the candidates—the inputs to the production optimization are the same between the two languages, given that the intended propositions are identical—before presenting the Spanish target rankings.

Constraints In addition to the constraints presented above that are equally relevant to Spanish and to English, we must entertain one further entry that corresponds to the lexical contrast between *ser* and *estar*:

(42) Fill Aspect: $\text{F}\textsc{ill}_{\textsc{asp}}$ (Based on Grimshaw, 1997, Full-Int)

—*No aspectual marker unless aspect is specified in the semantics.*

Satisfied whenever each input element maps to one of the elements of the candidate.

Violated whenever a candidate has an aspectual marker that is not required by the input.

The effect of $\textsc{Fill}_{\textsc{asp}}$ is to rule out the use of *estar* in contexts where *ser* is the target (true) copula—but it is one of the larger family of FILL constraints that penalize the realization within a candidate of any feature or structure that the input does not require. Thus when the lexical item *estar* appears in a candidate that does not have an AspP, it will violate $\textsc{Fill}_{\textsc{asp}}$.

Candidates The one additional variable that Spanish introduces, as just indicated, is the pair of lexical items that map onto the two BE functions, IL/SL semantics mapping onto *ser* and *estar*, respectively. Therefore the possible candidates multiply: whichever candidate previously had an overt *is* now requires two entries, one for each verb.

(43) a. Luis es enfermizo .
Luis SER sickly
'Luis is sickly' (IL)

b. Luis está enfermo .
Luis IS sick
'Luis is sick' (SL)

But once again, several of the candidates that embody the *ser*/*estar*-related permutations are harmonically bounded, which I briefly review in (44) and (45). Effectively, speakers *cannot* produce *estar* in the place of *ser* because it incurs a high-ranking FAITHFULNESS violation *in addition to* other violations—such that candidates that violate $\textsc{Fill}_{\textsc{asp}}$ by using *estar* where only *ser* belongs are harmonically bounded, i.e., ruled out.

(44) *Harmonically bounded candidates corresponding to IL input*

a. $[_{\text{AspP}}$ Luis es $[_{\text{SC}}$ t_{Lou} sickly$]]$ —*violates* PARSEASP; PARSET; $\textsc{Fill}_{\textsc{cop}}$

b. $[_{\text{AspP}}$ Luis está $[_{\text{SC}}$ t_{Lou} sickly$]]$ —*violates* PARSET; $\textsc{Fill}_{\textsc{asp}}$

c. [$_{\text{TP}}$ Luis es [$_{\text{AspP}}$ t_{Luis} -- [$_{\text{SC}}$ t_{Lou} sickly]]] —*violates* FILL$_{\text{COP}}$*; *F^2 (and *F twice)*

d. [$_{\text{TP}}$ Luis es [$_{\text{AspP}}$ t_{Luis} -- [$_{\text{SC}}$ t_{Lou} sickly]]] —*violates* FILL$_{\text{ASP}}$*; *F^2 (and *F twice)*

e. [$_{\text{TP}}$ Luis está [$_{\text{SC}}$ t_{Luis} sickly]] —*violates* FILL$_{\text{ASP}}$

(45) *Harmonically bounded candidates corresponding to SL input*

a. [$_{\text{TP}}$ Luis es [$_{\text{AspP}}$ t_{Luis} -- [$_{\text{SC}}$ t_{Lou} sick]]] —*violates* PARSEASP *and* FILL$_{\text{COP}}$

So many candidates, for the optimization of the IL input in particular, are ruled out by FILL$_{\text{ASP}}$ that its high ranking in the target grammar is evident. Crucially for the early development of target-like BE use in Spanish-acquiring children (both monolingual and, as we shall see, bilingual), the high ranking—higher than the structural constraints like *F—of FILL$_{\text{ASP}}$ need not be learned. This is because FILL$_{\text{ASP}}$ is an *output*-focused FAITHFULNESS constraint (as opposed to an input-focused FAITHFULNESS constraint like PARSET), which has the effect of implementing *grammatical conservatism* (cf. Snyder, 2011): children do not arbitrarily introduce new features into their utterances, but rather do so only when their primary linguistic data indicates they must (as in the case of the true IL copula *ser*). Thus when producing the Spanish copula optimizations in the upcoming subsection, I omit FILL$_{\text{ASP}}$, which is not violated by any of the candidates contained in those tableaux (because violators of FILL$_{\text{ASP}}$ were ruled out, as in (44), by harmonic bounding).

Spanish BE optimizations—child and adult

In the case of the Spanish IL optimization, the candidate with the overt copula beats the candidate with the null one, just as in both child and adult English—in spite of these winners' violation of the FILL$_{\text{COP}}$ constraint—precisely because FILL$_{\text{COP}}$ is ranked lower than the

Parse constraints.

<sickly(x), (x=Luis), T=pres>	ParseAsp	ParseT	*F^2	*F
☞ a. $[_{\text{TP}}$ Luis es $[_{\text{SC}}$ t_{Luis} enfermizo]]				⊛
b. $[_{\text{SC}}$ Luis enfermizo]		*!		

Table 2.9: Spanish optimization for 'Luis es enfermizo' (IL)

In both the Spanish child and Spanish adult optimizations of the SL proposition, it is vital that ParseAsp and ParseT outrank *F and *F^2, so that the tense and the aspectual features of the input, respectively, can get parsed in spite of the additional structure that is needed to house them.

<sick(x), (x=Luis), T=pres, ASP=perf>	ParseAsp	ParseT	*F^2	*F
☞ a. $[_{\text{TP}}$ Luis está $[_{\text{AspP}}$ t_{lou} $e_{[+\text{Asp}]}$ $[_{\text{SC}}$ t_{Luis} enfermo]]]			⊛	⊛⊛
b. $[_{\text{AspP}}$ Luis -- $[_{\text{SC}}$ t_{Luis} enfermo]]]		*!		*
c. $[_{\text{TP}}$ Luis está $[_{\text{SC}}$ t_{Luis} enfermo]]	*!			*
d. $[_{\text{SC}}$ Luis enfermo]	*!	*		

Table 2.10: Spanish optimization for 'Luis está enfermo' (SL)

I have shown in this section that with just a small number of constraints and a comprehensive candidate set it is possible to capture not only the difference between child and adult BE production patterns in English—even respecting the distinction relating to different predicate types, which are reflected structurally—but also the optionality present at specific point in children's grammatical development *across* those predicate types. From this series of optimizations I now turn to the task of generating and testing a prediction about BE development in *bilingual* acquisition, holding the knowledge pertaining to each language within a single OT grammar.

2.5 Facilitation in Optimality-Theoretic terms

Here we begin to tackle head-on the feasibility and plausibility of an integrated model of bilingual grammatical architecture as it pertains to the phenomenon in question. The fact that Spanish has two lexical entries roughly serving the function of BE, while English has just one, is perhaps only incidental to the predictions that can be made about the acquisition of BE if what bilingual speakers are acquiring is a single set of grammatical constraints—or perhaps it is critical, driving the acquisition of a universal grammatical distinction which should be available for both languages, by focusing the grammar on the contrast at a lexical level.

A large piece of the groundwork for the integration account has been laid by the rankings that I have developed to generate the target production outputs in Spanish and in English—for those rankings are one and the same. If the knowledge that a child uses to produce an utterance in *either* of her languages is contained within a single system, and if the target organization of the system possesses the same relative constraint rankings, then the time that it takes to arrive at the target ranking could in principle be minimized if one language supplies more evidence of the target ranking than the other one does. Recall the prevalence of omissions—from frequent to very frequent—that were produced by English monolingual children. I provided an Optimality-Theoretic explanation of these omissions that looked not to predicate types *per se* but to children's often limited ability to represent structure (as the result of floating FAITHFULNESS constraints).

Spanish, however, furnishes strong evidence that FAITHFULNESS constraints must be ranked high, along two distinct lines. Along one line, the characterization of 'high' is properly elaborated, 'FILL$_{ASP}$ higher than FILL$_{COP}$': it is far less problematic to insert a simple copula (*ser*), to satisfy the requirement that tense be overt, than it is to insert an aspectually-marked form (*estar*) that confers no additional advantages on the optimization. In other words, *ser* is inserted so that a violation of PARSET can be avoided—but in an IL utterance, inserting *estar* means adding an additional lexical item *and* additional meaning (in the form of perfective aspect), which, to reiterate, a grammatically conservative child is unlikely to do. In contrast, in English there is no lexical distinction to supplement or bring to the fore the structural distinction—and so there is nothing in English primary linguistic data that can inform the position in the ranking of FILL$_{ASP}$. And along the other line, Spanish has a rich system of verbal inflectional morphology, which signals to the child that functional features of the input to production need overt manifestations. Such evidence encourages the speedy reranking of *F below PARSET, which may 'kickstart' the process of moving MARKEDNESS constraints beneath FAITHFULNESS constraints—of moving from a child-like to an adult-like ranking.

Having taken as our point of departure the generally target-like early use of BE in Spanish and equipped with an Optimality-Theoretic depiction of how those target-like utterances are generated, we look back to the constraint rankings that I have shown underlie target-like production of both English and Spanish BE and engender the prediction of facilitation in the development of BE in Spanish-English bilingual children. There is only one ranking to acquire—but Spanish supplies abundant evidence for it while English does not. Being exposed to both languages naturally hastens the progress toward that adult-like constraint ranking. Some additional machinery is needed to make the prediction go through, and I walk the reader through those additions before seeking to confirm the prediction using corpus data.

2.5.1 Modifications to the input

In order to capture two sets of utterance types—two languages—within OT, it is necessary to posit a categorical distinction between the two and to ensure that that distinction does not flout any of the fundamental features of an OT grammar. Fortunately, there is an inherent distinction between languages that can be reflected as a categorical one at the level of the syntax: the phonology. Bilingual infants are somewhat slower than monolingual infants to draw some of the basic phonemic contrasts of their native language, particularly when the contrast is only evident in one language of the two. For example, the /e/ vs. /ɛ/ contrast in Catalan is detected by Spanish-Catalan bilinguals at 4 months, as it is by Spanish monolinguals and by Catalan bilinguals (i.e., all groups are 'universal perceivers'); by 8 months both the Spanish monolinguals *and the Spanish-Catalan bilinguals* have lost the /e/ vs. /ɛ/ contrast; but by 12 months the bilinguals regain the contrast, having by that point had enough exposure to it (and its significance) in Catalan that the contrast is cemented in their phonology (while only being operative in Catalan: Bosch and Sebastián-Gallés, 2003). By 12 months of age bilingual children generally make the bulk of language-specific phonological distinctions needed to guide their word-learning (Sebastián-Gallés and Bosch, 2005), although they also show a delay in using minimal-pair contrasts to guide word-learning in word-picture association tasks (in Fennell et al., 2007, monolinguals succeed at 17 months, bilinguals at 20).

But in contrast to these laboratory-derived early word-learning delays, between age 1 and age 1;6 bilingual children make the appropriate lexical and pragmatic categorizations by language (i.e., use the correct language with the correct parent, even when translation equivalents are already available in their lexicon: Nicoladis, 1998). By age 2 French-English bilingual children are capable of immediately responding in (and maintaining) the appropriate language during an interaction with a new interlocutor, i.e. with a complete stranger (Genesee et al., 1996). Given that the possible syntactic contrasts of a greeting in child-directed French or child-directed English are not great (46), some other cue must alert the child to which language she should use.

(46) a. French: *Bonjour!* (no structure)

b. English: *Hello!* (no structure)

This cue is likely the phonology.[27] And the very fact that bilingual children are slower to use minimal phonological contrasts to draw distinctions between word-object mappings suggests that they are *trying* to use phonological information, as well as word-learning heuristics perhaps unique to their acquisition situation, to map the new word onto the object *and* into the correct lexicon—a phenomenon that would be irrelevant were there not a categorical separation of phonologies and lexicons in the first place.

[27] Other evidence indicating language differentiation at the phonological and lexical levels early exists in the literature, but space considerations prohibit an exhaustive review.

What this discussion goes to show is that in *comprehension* in bilingualism, each string within the input to the comprehension optimization (i.e., each individual lexical item) should be tagged for language (e.g., with [+SP] or [+EN]). Because the form of the input is just a parsed reflection of the sound wave containing the utterance to be interpreted, and each parsed chunk displays the phonetic traits of the language in which it is spoken, it is clear that the input in bilingual comprehension must be tagged for language. Such an input might be structured as in (47).

(47) <{what does she see?}$_{[+EN]}$>

In (47), the language identifier is 'factored out' from the lexical forms because it is the only language being used in that utterance. But given the possibility of code-switching, for the comprehension case it is perhaps preferable to 'distribute' the [+EN] feature throughout the utterance, such that it is reflected on each lexical item, as in (48), 'What does she see when she wakes up?' with a code-switch at the adjoined temporal phrase.

(48) <what$_{[+EN]}$ does$_{[+EN]}$ she$_{[+EN]}$ see$_{[+EN]}$ cuándo$_{[+SP]}$ despierta$_{[+SP]}$?>

Language tags could in this way be present on the smallest components of meaning, even on individual morphemes, for comprehension certainly. And as Legendre and Schindler (2010) argue for production-directed code-switch optimizations in Urban Wolof (a mixed Wolof/French language of urban centers in Senegal), language tags even on bound morphemes are an effective way of capturing the contributions of bilingual competence in language use.

While the insight of 'morpheme-plus' language-tagging is undoubtedly on the right track for the code-switching context, in this study I idealize away from morpheme-specific tagging given that I do not focus on code-switching utterances; in the corpora used here one can find a small number of code-switched utterances, but none of these relate to predicative sentences nor to any of the other phenomena addressed here.[28]

To return, then, to 'monolingual' utterances produced by bilinguals, on the production side it not obvious that each concept within the propositional structure of the input should be tagged by language, as we saw in (48). Rather, considering that a speaker can choose to produce an utterance in one language or the other—on demand—it may be that the proposition itself, as represented in the input, is tagged for language, as in (49), which parallels the comprehension representation in (47).

(49) <see(x, y), (x=Mommy, y=what), x=topic, y=[+Q], T=pres> $_{[+EN]}$

Another, perhaps more plausible, way of representing the suggestion in (49) is to add another feature to the 'numeration': x is a topic, the tense is present, *the language is English*.

(50) <see(x, y), (x=Mommy, y=what), x=topic, y=[+Q], T=pres, **LANG=EN**>

At present I can see no theoretically important difference between (49) and (50), at least with respect to how the inputs would be processed through *Gen* or how they would be subjected to *Eval*. It is possible that one or the other options has more 'psychological plausibility': language *may* be a qualitatively different kind of mental object from features like tense or topichood—or it may not. There is a long precedent in the psycholinguistic literature for using tags as a way in which bilingual speakers may differentiate their two languages (see, for example, the model displayed in Figure 1.1 (Chapter 1: Hartsuiker et al.,

[28]In the corpora there are 'code-mixes', where a word not available to the child in the lexicon of the language that she is speaking is substituted with its other-language counterpart, but there are few if any true 'code-switches' touching on theoretically interesting parts of the structural representation.

2004), in which lexical items are implicitly tagged for language). Real-time cross-linguistic influences on comprehension and production processes seem to depend on the input and output language of multiple levels of an utterance (e.g., syntactic structure, cognate status), and while the precise status of speakers' access to language-specific tags is still a matter of debate, most major proposals on bilingual language used in psycholinguistics do rely on this sort of a distinction (e.g. Green, 1998; Hartsuiker et al., 2004; Kroll et al., 2008).

I will forgo further discussion of the representation in (48): since comprehension is the inspiration for that variant on the representation but not a major aspect of the explanation I am offering here, I leave behind individually-tagged concepts within the input proposition (which, critically, are inputs to production rather than to comprehension) for the remainder of this project.

The function of the tags in the present case is rather straightforward: they serve to rule out the production of an utterance in one language that was intended to be produced in the other. Since I have proposed to tag inputs for language in just the same way as they are tagged for, e.g., information-structural features, another member of the Parse family of constraints can be brought into the fold in order to ensure that the mapping from the input feature to each (monolingual) winner of an optimization is maintained. I thus propose to add another constraint into the discussion, ParseL (for 'parse language'), which is defined in the following way:

(51) Parse Language: ParseL

a. *The language feature that characterizes the proposition is parsed.*

b. Satisfied whenever the language in the input is on every constituent of a given candidate. Violated when a constituent is tagged for a language that is not present in the input; multiple mismappings of input tags to candidate-constituent tags correspond to multiple violations.

ParseL may be violated when higher-ranked constraints are satisfied, and still give rise to a winning candidate; it is via this route that code-switching is possible in the system. This project does not address code-switching however, and so I assume that ParseL outranks *all* of the constraints that are being discussed in this chapter (and the subsequent), which allows me to continue presenting approachably-sized tableaux. In the discussion that follows, then, when an input is specified for language, I only reproduce the candidates generated from it that correspond to that language—because the candidates that do not correspond to that language would be ruled out by ParseL.

2.5.2 A learnable bilingual grammar

As discussed above, bilingual children do not have trouble responding correctly to the language in which they are addressed (Genesee et al., 1996). It is safe to assume that they do represent in what language an utterance will be produced, and so from their exposure to two different phonologies (and syntaxes, etc.) a planned utterance should come to be tagged for a language. The language tag, in either form proposed in the previous section, is a crucial element of the input to any optimization that gives rise to a bilingual's utterance. Otherwise the mapping from the proposition to the correct entries from the lexicon will not obtain.

Now that a mechanism has been established for representing the language in which an intended utterance will be produced, we can look to how learning Spanish and English simultaneously would give rise to the longitudinal facilitation observed in the corpus data.

2.5.3 Facilitation predicted by optimization

There are two plausible bases for the facilitation of the development of BE in the English of Spanish-English bilinguals, as discussed throughout: the early availability of TP on the basis of the rich morphology inherent to the paradigm of Spanish verbal inflection, and the transparency of the IL/SL ∼ *ser*/*estar* mapping, both of which I gave formal characterizations to in the previous section (§2.4.2). These two factors *combine* to engender the facilitation of both BE and target-like verbal inflection (i.e., tense and agreement) in the English of bilingual children who are acquiring Spanish simultaneously, in contrast to English monolinguals, who lag behind in the development of target-like use of both of these basic traits. In this section I address those two factors in Optimality-Theoretic terms to draw out the prediction of facilitated BE acquisition, incorporating the language tags discussed in §2.5.1 to keep undesired code-switching from entering into posited productions.

One important aspect of Spanish that causes many early productions to be target-like is the demotion of *F below PARSET: the requirement that finite verbs raise to T^0. Recall the examples from monolingual Spanish acquisition in Villa-García and Snyder (2009):

(79) *Flexible word order in early child Spanish*

a. (a)a pipi n(o) (es)tán
the pee not are
'The pee is not here' (Magín, Aguirre corpus, age 1;07)

b. (n)o (es)tá la f(l)or
not is the flower
'The flower is not here' (Magín, Aguirre corpus, age 1;08)

Word order cues and inflectional morphology are abundant in Spanish, and evidence suggests that V-to-T is itself acquired very early, i.e. around the second birthday (cf. Clahsen et al., 2002; Radford and Ploennig-Pacheco, 1995). The acquisition of such representational capacity is evidenced not only by the systematic use of the correct verbal inflection, but also by the fact that preverbal and postverbal overt subjects emerge at the same time in Spanish-acquiring children—the latter order being necessarily derived by verb movement from V^0 to T^0 (Villa-García and Snyder, 2009). Therefore the first crucial effect of acquiring Spanish and English together is to demote *F below ParseT, as in the optimization on a simple declarative input such as (2.11).[29]

<sing(x), (x = Robin), T = past, LANG=**SP**>	ParseT	*F
a. [Robin$_{SP}$ *e* [t$_{subj}$ canta.INF]]	*!	*
☞ b. [Robin$_{SP}$ cantó.PST [t$_{subj}$ t$_{v}$]]		⊛

Table 2.11: Learned Spanish ranking, *Robin cantó*, 'Robin sang': ParseT ≫ *F

The effect of this reranking is to begin to demote *F down the hierarchy, such that more structure is available rather than less. In fact, because (finite) verb movement in Spanish is so pervasive, any candidate displaying that operation will need to satisfy a variety of other

[29]In Table 2.11, candidate (b) harmonically bounds candidate (a), but this is just an artifact of the simple exposition that I supply here, not proof that (a) could never win for any language. Stay, for example, is violated by the winner of these two, while it is not by the loser; nevertheless the inclusion of additional constraints/candidates would not alter the crux of this proposal, namely that ParseT ≫ *F on the basis of the ranking learned *for Spanish*.

constraints that go unviolated in matrix clauses across both English and Spanish (several of which will be relevant in the following chapters). That PARSET outranks *F is beneficial for the acquisition of Spanish—and of English, which also ranks it crucially above *F in the adult grammar (as evidenced by, e.g., *do*-support in the context of negation: 'Sue *does* **not** sing' vs. '*Sue *sings* **not**').

The other vital piece is the demotion of *F^2 below both PARSET and PARSEASP; given that the demotion of *F^2 entails the demotion of *F, I only discuss the former here but presuppose that the latter is demoted along with it. In order for the Spanish-acquiring child to match her productions to those in her environment, she must not only select the appropriate lexical items from her intended proposition *and* inflect them properly—she must also select the appropriate BE verb in order to hook the predicate up to its subject. Recall that there are in fact two dimensions to the mapping of an input into the target candidate in Spanish. For every candidate in English that maps a predicative sentence into a generated candidate, there are two in Spanish, one with *ser*, and one with *estar*, as elaborated in §2.4.2.

I refrain from recapitulating the *ser*/*estar*-related optimizations here, but the conceptual characterization bears a brief refreshing: because the satisfaction of PARSEASP entails for Spanish that the ASPP be projected *and* that the correct verb be selected, the importance of its position in the ranking is made plain.[30] Unless PARSEASP and PARSET are both ranked *above* *F^2, the Spanish-learner would with equivalent probabilities produce *ser* and *estar* with aspectual predicates, which would not match the data available in their input. With the greater phonological salience of *estar* (relative to *ser*), overlooking the mismatch

[30]The provision of the additional criterion for the satisfaction of PARSEASP is in line with the cross-linguistic patterns that distinguish both syntactically *and lexically* between the two BE types, as discussed in the introductory section.

between child productions and the data around her would be a difficult and undesirable task—avoiding this task is simply a matter of demoting the *F constraints below ParseT and ParseAsp, and maintaining the high ranking of Fill_{Asp}, so that the right mappings can obtain.

And so instead of assembling the optional projection of either AspP or TP, the child comes to map the aspectual feature, correctly, into an aspectual phrase, which was already available because *F was demoted beneath the Parse family of constraints long before on the basis of Spanish's rich morphology.[31] Thus the combination of that lexical contrast and the verbal inflection paradigm conspire to cause Spanish-acquiring children, both monolingual and bilingual, to arrive at the target ranking sooner than English monolingual children.

Thus when evaluating candidates generated for an input tagged for Spanish, a bilingual child produces the utterances represented by the '(a)' candidates both in Tableau 2.12 and in Tableau 2.13.

<sickly(x), (x=Luis), t=pres>	ParseAsp	ParseT	*F^2	*F
☞ a. [$_{TP}$ Luis es [$_{SC}$ t_{Luis} enfermizo]]				⊛
b. [$_{SC}$ Luis enfermizo]		*!		

Table 2.12: Bilingual Spanish optimization for 'Luis es enfermizo' (IL: previously Table 2.9)

[31]It is possible that ParseT and ParseAsp are not strictly ranked relative to each other in many English-acquiring children's grammars, as the *lack* of contrast between rates of finiteness in their stative and eventive main verbs attests (cf. Deen, 1997; Hoekstra and Hyams, 1998; Becker, 2000). But in other languages such a contrast is reliably observed (e.g., German and Dutch: Wijnen, 1997; Becker and Hyams 1999), mirroring be contrast discussed throughout this chapter; the lack of English contrast may have its roots in the impoverished system of English verbal morphology. It is therefore reasonable to claim that the larger number of factors in a child's primary linguistic data that can draw attention to this distinction, the earlier she will acquire it—a possibility elegantly embodied by Spanish, which has both the IL/SL lexical contrast *and* rich inflectional morphology.

<sick(x), (x=Luis), T=pres, ASP=perf>	PARSEASP	PARSET	*F^2	*F
☞ a. [$_{\text{TP}}$ Luis está [$_{\text{AspP}}$ t$_{\text{Luis}}$ $e_{[+\text{Asp}]}$ [$_{\text{SC}}$ t$_{\text{Luis}}$ enfermo]]]			⊛	⊛⊛
b. [$_{\text{AspP}}$ Luis -- [$_{\text{SC}}$ t$_{\text{Luis}}$ enfermo]]]		*!		*
c. [$_{\text{TP}}$ Luis está [$_{\text{SC}}$ t$_{\text{Luis}}$ enfermo]]	*!			*
d. [$_{\text{SC}}$ Luis enfermo]	*!	*		

Table 2.13: Bilingual Spanish optimization for 'Luis está enfermo' (SL: previously Table 2.10)

Likewise, when evaluating candidates generated for an input tagged for English, with the very same grammar, the child produces the target utterances as well, as the two tableaux below show—returning now to the candidates that were originally discussed as being generated from the English input (as in §2.4.1).

<sickly(x), (x=Lou), T=pres, LANG=EN>	PARSEASP	PARSET	*F^2	*F
☞ a. [$_{\text{TP}}$ Lou is [$_{\text{SC}}$ t$_{\text{Lou}}$ sickly]]				⊛
b. [$_{\text{SC}}$ Lou sickly]		*!		

Table 2.14: Adult/bilingual English optimization for 'Lou is sickly'

<sick(x), (x=Lou), T=pres, ASP=perf, LANG=EN>	PARSEASP	PARSET	*F^2	*F
☞ a. [$_{TP}$ Lou is [$_{AspP}$ t$_{lou}$ $e_{[+Asp]}$ [$_{SC}$ t$_{Lou}$ sick]]]			⊛	⊛⊛
b. [$_{AspP}$ Lou -- [$_{SC}$ t$_{Lou}$ sick]]]		*!		*
c. [$_{TP}$ Lou is [$_{SC}$ t$_{Lou}$ sick]]	*!			*
d. [$_{SC}$ Lou sick]	*!	*		

Table 2.15: Adult/bilingual English optimization for 'Lou is sick'

Thus we have seen that Spanish is predicted to have a two-pronged positive effect on the development of English BE. This was engendered by an OT account, requiring some modifications in order to accommodate the grammatical knowledge pertaining to two languages but not dramatically altering the fundamental characteristics of the architecture. In the next section I show that this prediction is in fact borne out by corpus data on Spanish-English acquisition of BE.

2.6 Acquisition of BE in Spanish-English bilinguals

To show that the prediction of BE facilitation is correct for Spanish-English bilinguals, I first review a previous study of the development of BE in (Iberian) Spanish-English bilingual children, then supplement it with additional data from the same corpus and still more from another one. Both of these corpora converge on the conclusion that the rates of BE omission in the English of Spanish-English bilinguals are significantly lower than those of monolingual English-speaking children, which will lead me to explore a further prediction of the account just given, in the domain of non-finite root forms.

2.6.1 Fernández-Fuertes and Liceras (2010)

Juana Liceras, Raquel Fernández-Fuertes, and colleagues embark on an investigation of the development of BE in the English of the Spanish-English bilingual identical twins, Leo and Simón, of the FerFuLice corpus (Liceras et al., 2008), inspired by the findings and discussion in Becker (2000). The distinction that Becker identifies in the omission patterns of monolingual English-acquiring children with respect to BE makes it plausible that some interesting effects could be found in Spanish, where the distinction (approximately) between IL and SL predicates (i.e., nominal and locative, or permanent and temporary) is mapped onto different lexical items: *ser* and *estar*.

The authors code all of English tokens of BE in Leo and Simón's spontaneous productions that occur between ages 2;0 and 3;4 (mean MLU < 3), including those predicative sentences where BE is required but omitted. To this end they note that they paid particular attention to context, such that intended determiner phrases (e.g., 'the book on the table') would not be mistaken for erroneous predicative sentences (e.g., 'the book *(is) on the table'). Tabulating the number of overt and null BE, the authors discover that the frequency of BE omissions is significantly lower in the bilinguals' English than in comparable monolinguals' English (as represented by the children analyzed by Becker, 2000). The use of overt BE is quantified in Table 2.16; this could be directly compared with Becker's results (previously Table 2.2 in §2.3.1; repeated here as Table 2.17).

	Nominals (IL)	**Locatives (SL)**	**Adjectives**
Leo	90.5 (115)	88 (22)	89.2 (58)
Simón	91.9 (125)	89.2 (25)	95.8 (69)
% of overt BE	91.2	88.6	92.5

Table 2.16: Explicit BE by predicate types and adjectives; each entry for Leo and Simón is formatted as *% over total (# of cases)* (Fernández-Fuertes and Liceras, 2010, p. 540, Table 8)

	Nominals (IL)	**Locatives (SL)**
Nina	74.1 (143)	14 (115)
Peter	81.2 (401)	26.7 (90)
Naomi	98.7 (102)	38.1 (31)
Adam	44.4 (303)	4.9 (26)
Eve	39.8 (206)	54.8 (33)
% of overt BE	65.8	27.7

Table 2.17: Explicit BE by predicate types from Becker (2000); each entry formatted as *% over total (# of cases)* (p. 89, Table 3.3)

The differences between the twins' BE use and that of Becker's monolinguals are significant no matter how the comparison is made (i.e., collapsing across contexts or holding each context separate), and while the rate of omissions with SL predicates is slightly higher than it is with IL predicates, that difference itself is not significant. This demonstrates both a qualitative and a quantitative distinction between the monolingual and the bilingual patterns of overt BE. It is the bilinguals whose BE use becomes target-like at an earlier MLU, confirming the prediction that Spanish and English being acquired simultaneously should lead to a bilingual advantage in the acquisition of the English version of that lexical item. We thus have clear evidence that Spanish exerts a positive influence on English in the domain of BE development; naturally more data is desirable insofar as it is available, and I provide what more we can glean from existing Spanish-English corpora in the next section.

2.7 Novel corpus analyses of BE

An additional corpus analysis, this time of a Caribbean-Spanish/British-English bilingual,[32] will now confirm the pattern first documented by Liceras and colleagues; beyond this, I explore the occasional (previously undocumented) Spanish errors produced by the twins for any evidence of inverse, i.e. English-to-Spanish, cross-linguistic influence.

2.7.1 Description of corpora

The Deuchar corpus (Deuchar and Quay, 2001) is a longitudinal study of one bilingual child, Manuela, whose father spoke Caribbean Spanish (a blend of Cuban, Dominican, and Panamanian) and whose mother spoke British English. At age 1;3, the child heard on average English 48% of the time and Spanish 52% of the time. Recordings were made weekly over a 2-year period from age 1;3 to 3;3, always in the child's home in England, and her grandmother, also a native speaker of English, functioned as an additional important caregiver and interlocutor. Caribbean Spanish diverges from standard Spanish with respect to syntactic properties that do not concern us immediately, including the frequency of use and the placement of overt subjects, in that it tolerates immediately preverbal subjects even in argumental *wh*-questions (i.e., *qué ellos trajeron a la fiesta?* 'what they brought to the party?', from Ordóñez and Olarrea, 2006), although various constraints as to subject-DP length as well as person may apply (see Davis, 1971; Quirk, 1972; Lipsky, 1977; Baković, 1998; Ordóñez and Olarrea, 2001, for a series of analyses of this phenomenon).[33]

[32] As I describe below, the Spanish spoken by the Caribbean-speaking parent is not relevantly different from Iberian Spanish.

[33] As a point of reference for the upcoming chapter on *wh*-questions, it should be noted that even though this corpus has as its representative Spanish-speaker someone who uses a Caribbean dialect, his Spanish does not present any instances of preverbal subject-DPs in *wh*-questions.

As alluded to above, the FerFuLice corpus (Liceras et al., 2008) follows two bilingual identical twins, Leo and Simón, being raised in Spain by a Iberian Spanish-speaking father and an American English-speaking mother. The boys were age 1;03 in the first English-language corpus included here and 1;05 in the first Spanish one. The father always addressed the children in Spanish and the mother in English; the surrounding environment was Spanish-speaking for 10 months out of the year, although for two months per year, the family traveled to the United States and spoke virtually solely English. The parents also addressed each other predominantly in Spanish while in Spain, that is, for just over 80% of the year, so even though there is no data included with the corpus about the overall exposure that the boys have to each of their two languages, it might be assumed that they heard more Spanish than English after their first year of life, which had been spent primarily in the care of their English-speaking mother. This presumed Spanish dominance is also apparent in their English speech, which shows the *phonological* characteristics of Spanish more strongly than more balanced bilingual children's speech might (and than the Deuchar corpus's Manuela's speech does): in a brief sample recording (subjects' age = 2;08) some Spanish allophones were observed. For example, a child used [l] where an American English speaker would use [ɫ] and [s̺] where an American English speaker would use [s].

2.7.2 Development of BE in bilinguals' English

The previous study of the FerFuLice corpus (Fernández-Fuertes and Liceras, 2010) focused on the development of BE in the English of Spanish-English bilinguals and, as was presented in some detail in §2.6 and specifically in Table 2.16, reported the striking result that has inspired the investigations contained in this section (study also published as: Liceras et al., 2008; Fernández-Fuertes and Liceras, 2010; Liceras et al., 2011). The study reveals that the bilingual children in the FerFuLice corpus produce English BE forms at a rate of accuracy very similar to what is typically seen in (monolingual and bilingual) Spanish BE production, and while they do produce more utterances without overt BE with SL than with IL predicates, just like the children that Becker studies, they use BE in English with approximately 90% accuracy with both classes of predicates (in contrast with Becker's sample which uses overt BE in about the 30%–60% range). This distinguishes them sharply from the monolingual English-speaking children who routinely omit BE well into their third year.

I coded the Deuchar corpus for English BE contexts using the same criteria as Fernández-Fuertes, Liceras, and colleagues, and found the same pattern: of 97 contexts requiring overt BE in Manuela's productions in the Deuchar corpus, 95 of them contained that morpheme with the correct inflection. The two errors, both produced at MLU 3.76, are given in (52–53).

(52) row yyy down loo loo loo loo life but dream yyy look.

(53) And that big Boy.

It is clear in the first example that the child is producing some version of the children's song "Row, Row, Row Your Boat," and she omits the determiner that would be needed on 'dream' in addition to omitting BE. In the second example, while without context the omission may not obviously be an error, the child's grandmother recasts her utterance so that it contains 'is', without objection from Manuela. Therefore the one unequivocal BE omission in the English of the Deuchar corpus corresponds to an IL predicate, but as it is only a single example, there is little that can be made of it.

2.7.3 New data on Spanish-English bilinguals' Spanish BE

The Deuchar corpus's *Spanish* files have not been previously analyzed for the use of *ser* and *estar*, and little detail is available about the analysis of the FerFuLice corpus that is reported in Fernández-Fuertes and Liceras (2010). It is important to understand the patterns of BE use in the bilinguals' Spanish because of the individual variation that has been documented among *monolingual* Spanish-acquiring children with respect to their use and omission of BE. Generally speaking, Spanish-acquiring children do not omit many BE verbs, and never do as often as English-acquiring children do, as §2.3.1 showed. But given the pattern of proto-copula use discussed by Silva-Corvalán and Montanari and the principled possibility of negative cross-linguistic influence (i.e., from the usual English omission patterns to omissions in Spanish), we need to verify that the predicted absence of negative influence of English on the Spanish of the bilingual is accurate.

The Deuchar corpus was hand-coded for all instances of utterances containing, or that should have contained, either of the two Spanish BE verbs; because the FerFuLice corpus was error-coded in its original transcription an automated search was conducted for all instances of Spanish BE and for all noted omissions of the same. Coding the Deuchar corpus yields 92 contexts that require either *ser* or *estar*, 91 of the uses are target-like, showing the appropriate distribution of the two BE verbs with respect to the IL/SL distinction they embody. Beyond these, one omission error is found, shown in (54).

(54) eso una pala
that *(is) a shovel

The discourse context in which this error is found leaves some room for doubt as to whether the error constitutes an omission of BE or rather some confused utterance: the child has been miming the action of scratching one's head, and when the mother asks, "Scratching like that?" and the child gives assent, the mother then asks, "And why?", to which our error is given in response. Further, after the child's apparent claim that "That is a shovel," the mother recasts what she perceives the child's intention to be as "He has a spade?", to which the child answers affirmatively again. Therefore, as Hoftheuer (2009) repeatedly warns, omissions of BE must be interpreted in the light of the complexity of the discourse context, and in this instance it is probably safest to claim that the child commits no errors that definitively involve BE.

Digging into FerFuLice's (Iberian) Spanish BE

The situation with the FerFuLice corpus, perhaps because of its larger size, is somewhat more interesting. Of 2889 tokens of BE in the Spanish of Leo and Simón, Simón is responsible for producing 1479; Leo produces the remaining 1410.

There are again in this corpus no omissions of a BE verb in a context that requires one, but there are a handful of mistaken uses of BE that should be viewed in light of the various monolingual generalizations that we saw above. SIM and LEO are the bilingual children; the other labeled speakers are familiar Spanish-speaking adults.

The first five examples all use a form of *ser* where *estar* would have been appropriate according to the context. It is somewhat unsurprising to see most of these errors, because they occur with adjectives many of which can appear with *ser* or with *estar* depending on the context. Recall that this was the critical observation of Schmitt and colleagues, namely that the difficulty that children have with selecting the correct BE verb may revolve not around a strictly syntactic or even semantic computation, but rather with a pragmatic one: children must compute the relevant properties of the discourse context in order to select one verb or the other.

(55) From File 24i_02 —

SIM:	está fría.	*it* estar *cold.*
IVO:	papilla muy bien.	*purée very good.*
SIM:	**es fría es fría !**	ser *cold!* ser *cold!*
IVO:	está fría?	[correcting] estar *cold?*
SIM:	está fría.	estar *cold.*

The first of the examples, with the adjective *fría* 'cold' would appear to respect the implicature associated with *ser*, namely that the property being attributed to an object is permanent rather than temporary, IL rather than SL, and as the child is describing the freezer in the kitchen, it is natural to infer that *ser* is the appropriate verb to use. However, weather and temperature predicates are always combined with *estar*, and so this perhaps idiomatic usage was not yet mastered by the child Simón.

(56) From File 26_01 —

RAQ:	arriba !	*up!*
SIM:	sabes?	*you-know?*
SIM:	**sono un poquito malito lo sabes?**	*I* ser *a little sick you know?*
RAQ:	tú estás un poquito malito?	*you* estar *a little sick?*
SIM:	sí.	*yes.*

(57) From File 29_02 —

RAQ:	anda y las caras dónde están?	*hey and the faces where* estar *(they)?*
LEO:	no lo sé.	*I don't know.*
SIM:	**es escondidas**.	ser *hidden.*
RAQ:	se las ha comido Coco?	*did Coco eat them?*
SIM:	sí no pues están pintadas.	*yes no well they* estar *colored.*

The second and third examples are more difficult to interpret, particularly considering that they also display errors in conjugation, a morphological overextension in the second example and a non-agreeing, possibly default form in the third. While the adjective *malito* 'sick' here is the diminutive of *malo* 'unwell', it could be misconstrued by the child as representing the diminutive form of *malo* 'bad', which appears canonically with *ser*. The *ser+malo* combination is far more prevalent in child-directed speech than the *estar+malo* combination—40 tokens of the former and only 1 of the latter—which could explain why the child uses a default form of *ser* where the context of the situation, and the meaning of the very adjective he chose, should have compelled the use of *estar* instead. These can be relatively safely counted as relevant errors.

(58) From File 67_01 —

LEO:	los botones.	*the buttons.*
LEO:	jo!	*whoa!*
LEO:	**esto es [= está] muy fuerte.**	*this* ser *very tight.*
LEO:	es eso.	*that* ser *it.*

(59) From File 75_01 —

EST:	como una ele eso es.	*like an 'L' that* ser *it.*
SIM:	azul.	*blue.*
SIM:	no, esta es dura.	*no, this one* ser *hard.*

In the next pair of examples, with *fuerte* 'tight, strong' and *dura* 'hard', marking these as errors requires a great deal of sensitivity to context. In the *fuerte* case, the child is attempting to manipulate a button and finds it tightly connected to its fabric, and in order to coerce this 'tight' meaning of the adjective the verb *estar* is required; it is not that the button itself is strong but rather that the connection that it is temporarily found in is strong, hence the need for the SL-related verb. From the context alone I cannot determine why the example with *dura* calls for *estar*, but supposing that the transcribers were responding to something in the context of the original recording that is not reproduced in the transcript, it is conceivable that *estar* would represent the appropriate choice. It is possible, however, that given what I imagine is the entrenched usage of *duro* with *ser* the grammar would not have suppressed the default verb choice, *ser.* Deciding definitively whether these utterances are errors would require access to unavailable information, but as they *appear* to be errors and raise interesting issues about the role of context and frequency of exposure, they bear reproduction.

(60) From File 63_01 —

RAQ:	es que fíjate y me dicen que.	*it's that look and they tell me what.*
LEO:	así que precaparaos [: preparaos] a pagar a mí!	*so prepare yourselves to pay me!*
LEO:	**y espero que coja un tu hotel porque si no el uno que mi [: me] paga dos mil yo estoy [= soy] rico !**	*and I hope that he picks your hotel because if not the first one that pays me 2,000 I* estar *rich!*
LEO:	si lo tienes yo estoy rico!	*if you have it I* estar *rich!*
EST:	jo serás rico.	*whoa you will* ser *rich.*

This last example may be an erroneous correction on the part of the transcribers: it appears that Leo describes himself as *rico* 'rich' in this hypothetical using *estar* precisely because he is using *rico* as a change-of-state adjective, and hence *estar* would be the appropriate verb choice. I believe that rather than being an error this example displays a mastery of one of the subtler constraints on the uses of *estar*: even though an adjective can represent an individual-level attribute, *estar* can be used if that attribute is recently acquired to signal the change of state. This observation is especially relevant here because typically *estar* coerces the meaning of *rico* from 'rich' as in moneyed to 'rich' as in delicious, which is clearly not what is meant in the child's utterance, speaking as he is of being paid in a game of Monopoly.

2.7.4 Summary

By coding an additional corpus of a Spanish-English bilingual child acquiring a (relevantly) similar variety of Spanish as the children in whom facilitation was first documented, I have confirmed the existence of the facilitation phenomenon in the English of bilingual children whose Spanish possesses a robust lexical distinction mapping almost directly into the semantic contrast that in turn is reflected syntactically.

In addition, by examining the *Spanish* BE productions of the same children's spontaneous speech, I have shown that they do not experience interference from the language with fewer overt distinctions to the language with more: the existence of only one option in English *does not* encourage the adoption of a default form in Spanish. This contrasts with the findings of Silva-Corvalán and Montanari (2008), who document a period of use of what is apparently a default BE in the Spanish of the Spanish-English bilingual child they study—but, crucially, that child was acquiring a *contact* variety of *Mexican* Spanish. Mexican Spanish already has a very restricted set of usages of *ser* (cf. López-González, 2010), and in contact with English it could plausibly shrink that set of usages even further. In other words, it is the robust nature of the *ser*/*estar* contrast in Iberian Spanish that both (1) makes possible cross-linguistic facilitation of English BE and (2) keeps the monolithic English BE from encouraging the adoption of a single 'default' BE in bilinguals' Spanish.

A new prediction suggested by an old story

Fernández-Fuertes and Liceras (2010) explicitly set out to compare analyses of the FerFuLice corpus to the analyses of monolingual English corpora presented in Becker (2000). As I reviewed in §2.6.1, Fernández-Fuertes and Liceras find an early parallel (but with fewer errors overall) to the English monolingual omission pattern—more BE omissions with SL than with IL predicates—and then a quick leap into target BE use by the bilinguals, while the monolinguals lag behind. They propose that, just as in Spanish monolingual acquisition, the Spanish-English bilingual children 'realize' quickly that utterances must be anchored to the discourse. But crucially, the authors claim that this happens *because* the *ser*/*estar* distinction draws attention to the more abstract IL/SL contrast, which in turn determines how much structure needs to be projected for a given predicate—a story which gives a somewhat more directed, causal flavor to the OT explanation offered earlier.

In a language without the lexicalized distinction between IL and SL predicates, Fernández-Fuertes and Liceras claim, any feature of the predicate that can tie the utterance to the discourse is sufficient to keep the derivation from crashing. IL predicates have no inherent temporal features that can check the tense operator and tie the utterance to the discourse properly, so they need to include an overt BE form to host the tense feature and not leave the utterance without a discourse connection. SL predicates however inherently have the temporal feature of 'aspect'—what makes them stage-level—and so the *semantic* content may be mistaken by the child to be sufficient to tie the utterance as a whole to the discourse, hence the relatively frequent omission of BE in SL utterances by many English-speaking monolingual children.

Spanish has the virtue of employing a different form of BE for each of these predicate types, so unlike English, where the contrast has no surface reflection, Spanish can draw attention to the difference and allow knowledge needed for English to *bootstrap* onto the representations that the lexical contrast makes salient. The Spanish SL BE *estar* is in addition rather phonologically salient: it has two syllables (e.g., *es* vs. *es.tá*, *soy* vs. *es.toi*, and it differs from most finite verbs in that its stress is word-final (*es.TA* vs., e.g., *BAI.la*). This salient contrast is at the center of the Fernández-Fuertes and Liceras proposal and is the cause, they claim, of Spanish-English children's speedy abandonment of Wexler's UCC, which ramifies throughout both their English and Spanish grammars.

Thus we have brought to the fore perhaps the most central prediction that the account of BE facilitation I have given precipitates: not only should BE occur more reliably in the English of Spanish-English bilingual children, but so should finite verbs generally. If these children have mastered the requirement that tense be marked on a verb in every matrix clause, via the demotion of *F and *F^2 below (at least) PARSET (as in, e.g., Legendre et al., 2002), then some errors common in English monolingual children's speech should be virtually absent from that of bilinguals. Therefore I now embark on the articulation of this prediction within the OT framework that I have already developed, and following that, its confirmation, before closing the chapter.

2.8 Non-finite root forms and the acquisition of finiteness

It was observed above that even though there are some omissions of the BE verbs in Spanish, omissions are far more common in monolingual English. But this is not only true of BE-type verbs. As I have occasionally mentioned, BE is effectively a functional item, and more precisely it is a functional item of a *verbal* inflectional sort. Especially in equative and identificational uses, the true copula (corresponding to the Spanish *ser*) serves no apparent purpose aside from overtly realizing tense (and person) inflection (cf. Higgins, 1979; Mikkelsen, 2005). With stage-level predicates, BE (or *estar* in most Spanish cases) at most betrays the aspectual nature of the adjective or of the locative phrase: as we saw in fn. 6, there are languages like Hebrew that do not even require overt BE when a default tense is used. What is more, the omission patterns of bound verbal morphology across languages are not uniformly distributed across all verb types: overt verbal inflection is more often omitted with eventive verbs than with stative verbs (Ferdinand, 1996; Wijnen, 1998; Hoekstra and Hyams, 1998). This pattern of morphological omissions in monolingual learners parallels the pattern reported in Becker (2000) in which stage-level BE was omitted more often than individual-level BE—an effect, Wexler (2000) argues, that can be traced back to the Universal Checking Constraint (UCC) that is operative in children's grammars and allows more features to serve to let the derivation go through than the adult grammar would.

Therefore, the acquisition of the syntactic generalization corresponding to the semantic BE contrast may be key to inflectional development, and if so, then the integration model of bilingual grammatical architecture could bear directly on predictions about the development of this latter feature in Spanish-English bilinguals. This is because finite verbs are used by young children more reliably and earlier in Spanish than they are in English, perhaps because of language-specific factors like verb movement and the ineffability of Spanish verbal roots without at least the addition of a thematic vowel in the coda (cf. Pratt and Grinstead, 2007) (see 61).

(61) 'speak' (default form)

a. * habl-

b. habl-a

But if those language-specific factors are indeed sufficient to cause Spanish-acquiring children to use finiteness marking appropriately, then the same grammatical representation via which finiteness surfaces in Spanish should be available for application to English as well.

Structural sharing in this sense would seem to lead to the prediction that both BE omissions and non-finite root forms (NRFs) should be less frequent in the English of Spanish-English bilinguals than it is in monolingual English acquisition.

Therefore if it is the case that the Spanish BE contrast is what *causes* Spanish-speaking children to learn that all finite utterances must be temporally anchored—must display finite morphology—then these children should use BE in a target-like way *before* they reliably produce finite verbal morphology on *all* verbs, that is, before they leave the non-finite root form (NRF) stage. The NRF phenomenon has been attested many times in the early speech of children acquiring non-*pro*-drop languages, who optionally use infinitives as root verbs (hence its alternative characterization as the "optional infinitive" stage: e.g., Wexler, 1994; Phillips, 1995; Hyams, 1996), but more recently some research has called into question whether (morphological) infinitives are really the only sign of a grammar with deficient tense-marking (Grinstead, 1998; Davidson and Legendre, 2003; Pratt and Grinstead, 2007; Grinstead et al., 2014, e.g.,). In languages with rich agreement/null subjects, rather than morphological infinitives unmarked 'default' forms are used optionally by young children—as reviewed in §2.3.2—although attested rates vary (cf. Guasti, 1994; Davidson and Legendre, 2003).

However, if the *ser*/*estar* contrast in Spanish speeds up the acquisition of matrix clauses' tense requirement, then after null BE disappear there should at least be no errors of tense inflection omission—and, arguably, (at least) fewer errors of person inflection ('agreement') omission.[34] Returning to the ranking presented for the optimization of predicative

[34]The fact that Davidson and Legendre (2003) find that in Catalan—a language with the same IL/SL contrast as Spanish—agreement is more reliably used by young children than tense is is a strike against this hypothesis. If BE contrast in Catalan were facilitating temporal anchoring on the whole, then children should use tense

utterances in Section 2.5.3, we need only propose new inputs and a small set of crucial candidates to see that the model does predict that the ranking learned for Spanish can be bootstrapped into use in English.

Let us take, for example, the pair of inputs in (62).

(62) a. <sneeze(x), x=Sonia, T=pres, LANG=EN> ('Sonia sneezes')

b. <sneeze(x), x=Sonia, T=pres, LANG=SP> ('Sonia estornuda')

These simple present-tense utterances pose a problem for many monolingual English-acquiring children, as surveyed above—but for Spanish children they do not. With a single ranking used for both languages, English finiteness should not pose the challenge for bilinguals that it does for monolinguals, because Spanish has already taught them that tense must be parsed (overtly).

The candidates needed to develop the prediction are simply one with a tense feature, the (a) candidates, and one without, the (b) candidates. In selecting a 'person' (i.e., first-person 'I', second-person 'you'), I have chosen a third-person subject, since it is the /-s/ suffix on the English third-person subject that is so often omitted, realizing a non-finite root form.[35]

more reliably than they do agreement (and on the whole very reliably). The difference between their findings and mine may simply be an artifact of methodology, however: they define the presence of a tense feature as marking of *non-present* tense, a stricter definition than is typically assumed and a stricter one than has been adopted here. I leave this question for future research.

[35] Unfortunately in seeking maximum correspondence across the languages here, I have had to settle for a third-person subject in Spanish as well, which is precisely the one that is homophonous with the default that *is* occasionally produced in lieu of another person inflection. Suffice it to say that for this example I am not assuming that the third-person inflection is anything but.

<cut(x), x=Sonia, T=pres, LANG=EN>	PARSEASP	PARSET	*F^2	*F
☞ a. [$_{TP}$ Sonia $e_{[+pres]}$ [$_{SC}$ t_{Sonia} sneezes]]				⊛
b. [$_{TP}$ Sonia -- [$_{SC}$ t_{Sonia} sneeze]]		*!		

Table 2.18: Target English optimization for 'Sonia sneezes'

<cut(x), x=Sonia, T=pres, LANG=SP>	PARSEASP	PARSET	*F^2	*F
☞ a. [$_{TP}$ Sonia estornuda [$_{SC}$ t_{Sonia} t_v]]				⊛
b. [$_{TP}$ Sonia -- [$_{SC}$ t_{Sonia} estornuda]]		*!		

Table 2.19: Target Spanish optimization for *Sonia estornuda* 'Sonia sneezes'

And while there are apparent structural differences between where a verb checks its finite tense feature—either by having the feature lower down to it, as in English, or by having the verb raise up to meet the feature, as in Spanish—with regard to the constraints that were operative with BE, the violation profiles are identical between languages, which suggests that we should see similar rates of NRF use in Spanish-English bilinguals' Spanish and English. Given the results on BE, it is likely that again facilitation will be observed, but it is also possible that finiteness could turn up *later* in Spanish-English bilinguals' *Spanish*, considering that this is a shared system. Because we have been able to capture facilitation of BE without reference to movement/traces, I test the NRF hypothesis in the bilingual corpora as well without making reference to the movement contrasts across the two languages. As we will see, the movement contrasts do not appear to influence the development of finiteness-related word order, and the prediction of facilitation is confirmed, in an analogy to the BE findings.

2.8.1 Confirming the NRF prediction

A review of the literature on NRFs in Spanish acquisition leads one to conclude that it is not a robust phenomenon in this language (*contra* Grinstead and Spinner, 2009; Grinstead et al., 2014, who in elicited production and judgment tasks find that young children accept NRFs)—even when the third-person singular form is counted as a possible default. Clahsen et al. (2002) examine the productions of María in the Ornat corpus of monolingual Spanish (López Ornat, 1994) and find that 55% of finite utterances use NRFs from 1;7 to 1;11, while only 4.3% do so between 1;11 and 2;8. That is, even during the one-word stage the child does not use only NRFs, and into the two-word stage she eliminates them virtually entirely from her productions. To supplement this conclusion, I coded the Montes corpus of monolingual Mexican Spanish (Montes, 1992) for use of NRFs and located only 7 such forms, all before age 2;3 (out of a total of 489 finite utterances). Thus at least when the focus is on spontaneous productions, Spanish-acquiring children do not often use NRFs, and very little after their second birthday.

The prediction generated by Fernández-Fuertes and Liceras (2010) is that *because* of the early acquisition of an adult-like version of the temporal anchoring constraint—itself due to the relevant lexical transparency in the Spanish paradigm—bilingual children should do two things: they should *not* omit BE, which they do not; and they should not produce NRFs. In this section, having generated the prediction independently, I seek evidence of its correctness.

One study has already addressed the use of NRFs in the smaller of the two bilingual corpora (the Deuchar corpus) but importantly only considers true morphological infinitives in its search for Spanish non-finite defaults (Berger-Morales et al., 2005). That paper claims that the use of root infinitives in Spanish and of 3SG forms in English lacking the *-s* agreement marker are sufficiently incomparable that they support a separate-systems or autonomous development hypothesis. The figures derived there are reproduced below as Table 2.20.

ssp

NRF	*English*		*Spanish*	
Age	**Tokens**	**%**	**Tokens**	**%**
1;11–2;2	13/48	27	3/105	3
2;5–2;6	1/56	2	3/205	1

Table 2.20: Non-finite forms out of all relevant contexts in the Deuchar corpus, using only true RIs in Spanish

I recoded the Deuchar corpus's Spanish files using the criteria of default forms in Romance and other rich-morphology languages (e.g., Davidson and Legendre, 2003), searching for infinitives, bare participles, *and third-person singular defaults* (i.e., those third-person forms that are not contextually appropriate). I found that out of a total of 311 finite forms, 172 had third-person singular morphology, and of those, only 5 were used incorrectly (in addition to the 6 traditional infinitive forms remarked by Berger-Morales et al., 2005).

How, then, does this compare with the incidence of non-finite forms in the English of bilinguals? Clearly the patterns are still different between the two languages, as a chi-square test confirms ($\chi^2 = 13.851$, $p < 0.001$), but the percentage in English is strikingly low relative to monolingual English children, especially so young. For example, Madsen and Gilkerson (1999) find that two English monolingual children, Nina and Naomi, produce 41% of their utterances with non-finite verbs between the ages of 2;4 and 3;3; Deen (1997) finds a higher rate of NRF usage in Adam and Eve, at an average of 75% across the time span between 1;6 and 3;5. By collapsing the two stages in which Berger-Morales et al. (2005) present their data, we can see that the percentage of NRFs in María's English is very low indeed during this early period: 13.5%.

Such a low percentage of English NRF usage during the period in which it tends to be most prevalent, coupled with no indication whatever that the development of Spanish inflection is adversely affected, is a good sign of facilitation in the domain of tense development. In order to confirm this pattern, I examined the corpus from Fernández-Fuertes and Liceras (2010) for use of non-finite forms—including bare stems as well as participles. These files correspond to ages 2;0–3;4 of the twins' speech, which I have collapsed over both children because their patterns are sufficiently similar. The English results of this investigation are presented in Table 2.21.

	NRFs	Finite forms	NRFs as % of relevant contexts
Stage 1	66	385	14.6%
Stage 2	27	637	4.1%

Table 2.21: English non-finite forms vs. finite forms in the bilingual FerFuLice corpus (ages 2;0–3;4)

As we can see, the patterns of NRF use in the FerFuLice corpus are analogous to the patterns in the Deuchar corpus—this is evidence of a robust pattern of facilitation of the development of tense/agreement in the speech of Spanish-English bilingual children's English.

The Spanish of the twins in the FerFuLice corpus, on the other hand, is unaffected by the presence of English input. Their rate of NRF production in Spanish is predictably low: of 993 contexts requiring a finite verb, agreement errors involving a default form instead of a first- or second-person, or third-person plural, form were found in 23 overt-subject utterances, such as (63) and in 10 null-subject utterances, such as (64), for which the intended subject could be confidently inferred; an additional 9 utterances contained bare participles, such as (65).

(63) *ha (di)cho que animales
(I) have.3SG said that animals
'I said "animals"' (Simón, 29_02)

(64) yo *hace una papilla Winnie Pooh !
I make.3SG a purée Winnie Pooh
'I make a purée for Winnie the Pooh!' (Simón, 24i_02)

(65) cuando se ende puedes ver qué *(ha) pasado con el lobo vale ?
when CL ends you-can see what *(has) happened with the wolf okay
'When it's over you can see what happened with the wolf, okay?' (Leo, 28_01)

The scarcity of incorrect forms like these shows that English has not negatively influenced Spanish, yet Spanish does positive influence English.

Documenting a real developmental progression would go a long way toward establishing that the lexical transparency inherent to the Spanish BE system is the *cause* of the facilitated development of tense/agreement in English. In particular, we would expect to see a pattern in which, for example, the rates of NRF use were *higher* than the rates of BE omission in an early stage, but then caught up with BE use so that both BE and finiteness generally were used appropriately—with BE having developed first. However, if such a stage of productions does exist for bilinguals, it is not evident in these corpora: the rates of NRF use and BE omission in English cannot be distinguished from one another by stage ($\chi^2 < 1$ for both stages, ns.).

The account of BE-derived inflectional facilitation may not be supported directly by the available developmental data, but viewed in light of other languages' acquisition patterns its plausibility increases. Although Spanish belongs to a large class of morphologically rich languages, it is also a member of a much smaller class of languages with an *overt* lexical contrast between IL and SL BE. Therefore, its acquisition can be meaningfully compared with other rich-morphology languages that do not have this contrast (or at least have it much less robustly). Modern Greek does not have the *ser*/*estar*-style contrast, and default forms comprise a greater percentage of young children's speech than the percentages we have just seen: between 1;9 and 2;5 children produce an average of 50% of their verb-containing sentences with default *i*-forms (Varlokosta et al., 1998). These ages are most directly comparable to María from the Deuchar corpus, who at the point of most NRF usage only reached a rate of 27%. Given the direct comparability of ages of the Greek and Spanish monolingual children and the clear difference in their rates of NRF usage, the lexical BE contrast in Spanish may indeed serve to expedite the acquisition of finiteness more generally.

Less compelling at first glance is the fact that NRFs are found in the earliest speech of Catalan-acquiring children at a somewhat higher average rate (an average of 36.3% at the earliest stage: Davidson and Goldrick, 2003)—yet Catalan shares the *ser*/*estar* contrast with Spanish. Yet if we instead collapse data across several PLU stages, all of which correspond to the MLUs represented by the FerFuLice files, we can see that the rate of NRF usage in Catalan *is* lower than in other rich-morphology languages: 15.3% of Catalan child utterances contain NRFs in PLU stages 2b, 3b, and 4b combined.[36] This rate almost perfectly mirrors the rates found in both the FerFuLice and the Deuchar corpora, suggesting that the lexical contrast that some Iberian languages possess between the IL and SL instantiations of their BE forms may indeed be the common factor among languages with rich verbal agreement systems and the incidence of default verb form usage by children acquiring those languages.

2.9 Unconfirmed alternative predictions

Given the current understanding of the patterns of BE development in English and in Spanish, and their corresponding theoretical accounts, several alternative predictions should be entertained regarding the possibility of cross-linguistic influence in BE use.[37] These predictions turn on the relationship between the grammar corresponding to each language: if something about a grammatical representation is made salient in the input from one language, then the only way it should influence the representations used in the other language is to posit a close link between the knowledge corresponding to each language.

Most germanely, the accounts that both predictions rely on represent variants on

[36] The PLU measure—Predominant Length of Utterance—is designed to be a more precise and longitudinally robust way of determining stages of grammatical development; it takes into account both the predominant length of utterances in a file *and* the frequency of utterances containing a verb, taken to be the marker of basic syntactic structure (Vainikka et al., 1999).

[37] Becker (2000) ventures no predictions about the acquisition of BE in monolingual Spanish in spite of the attention she pays to the mapping of the IL/SL distinction into *ser* and *estar* (approximately). In contrast, Schmitt and colleagues (Schmitt et al., 2004; Schmitt and Miller, 2007; Holtheuer et al., 2011) propose to explain the patterns of BE usage in acquisition, focusing not on the presence or absence of a BE verb but on the selection of one BE verb or the other: *ser* or *estar*. López-González (2010) takes a similar tack given that she, too, does not encounter errors of omission.

the isolation hypothesis, and in so doing do *not* generate the right predictions. A walk through two isolation accounts will show that these alternatives fail to account for the data—lending more plausibility to the integration hypothesis, which, I have argued and will continue to argue, is the more suitable account of bilingual grammatical architecture both on the empirical side and on the theoretical one.

2.9.1 No influence: Paradis and Genesee (1996)

As discussed in chapter 1, two opposing 'null hypotheses' can plausibly apply to the grammatical architecture of bilingualism, and the more common of these—the isolation hypothesis—straightforwardly predicts an absence of cross-linguistic influence. The Paradis and Genesee (1996) study presented in Chapter 1 shows that in French-English bilingual children, tense, person agreement, and negation develop along the time-course expected for each of those languages. The alternative possibility, namely that one language's course of development may influence the other's, does not obtain. The interpretation that the authors give to this finding is that the grammar corresponding to each language is autonomous: the development of the TP in English occurs later than the development of the tense phrase in French, even though at the most abstract level that phrase is identical between the two languages. Furthermore, the distinct time-course of the development of those grammatical features argues against the maturational view of grammatical development and for a structure-building approach, given that at a certain point in development there is evidence of a TP in one language (French) while it is absent from the other (English).

Making a prediction about the acquisition of BE in Spanish-English bilinguals from this perspective requires only a minimal amount of extrapolation from Paradis and Genesee's account. Be development relies crucially on the presence of TP in English: not only does be surface in T, but it is base-generated in T (for IL predicates, that is).[38] The frequent omissions of be by English monolingual children can be taken as an indication of the absence of a sufficiently strong representation (or a sufficiently strong Merge operation in a functional domain) of T, or, as Becker (2004) argues, as the result of a 'grammatical reflex' that permits an aspectual feature to perform the function of temporal anchoring usually reserved for a tense feature.

Either way, be develops relatively slowly in English due to representation-general factors. Spanish, on the other hand, shows precocious development of be, both *ser* and *estar*, although as we have seen above this can vary by dialect. And just as Paradis and Genesee claim that in the French-English language pair children's French T and English T develop along the same lines as monolinguals' do, they would claim as much for Spanish-English bilinguals as well, predicting earlier reliable use of be in Spanish than in English, and at least for English more omissions with SL-type predicates than with IL-type predicates. In addition, just as Paradis and Genesee find that the rate of bilinguals' omissions vs. overt uses of the several functional categories that they study falls within the range of typical monolingual patterns, their account would also predict that bilingual children's be development will fall within monolingual ranges for each of the respective languages.

As we have seen, this prediction is incorrect for both the specific case of be and the broader category of the acquisition of finiteness. The fact that Paradis and Genesee (1996) document cross-linguistic interference and do not seem to find the same kind of

[38] What is important here is that be is base-generated as a functional head rather than a lexical one; depending on one's theory of choice, be may be base-generated in, for example, T, or v ('little v'). Here I simplify to 'T'.

cross-linguistic bootstrapping that we saw in the Spanish-English language pair indicates that there must be an important related difference between Spanish and French. That difference appears precisely to be the BE contrast that Spanish supplies (and which French lacks). Hence without starting first with BE and then moving outward to finiteness, what positive contribution a key aspect of Spanish grammar could make to tense development, which French could not, would likely be missed.

2.9.2 Delay: Hulk and Müller (2000)

Hulk and Müller (2000) argue that cross-linguistic influence can occur if there is surface overlap between two languages and if the representation in question involves an interface between two modules of grammar. In this paper they find cross-linguistic influence with respect to object-drop in their Germanic-Romance bilingual subjects, which they claim satisfies both of the constraints inherent to their explanation. To show that both of the conditions they set forth are necessary in the prediction of cross-linguistic influence, the authors identify a domain of grammatical development that arguably satisfies only the interface condition of their account (and not the surface overlap condition).

The representative phenomenon that they select is root infinitives ('RIs': a subset of NRFs, displaying infinitival marking, as Berger-Morales et al., 2005 used for English), which Hulk and Müller claim satisfies the interface condition insofar as the use of root infinitives is possible in both adult Germanic and Romance, but only in very restricted contexts, as conditioned by the discourse. The fact that children use root infinitives more often than adults do can be construed so as to support this argument, given children's broad tendency to master strictly syntactic constraints before they master interface constraints with, e.g., pragmatics (Platzack, 2001).[39] Yet there is no surface overlap between root infinitive use *in typically-developing Germanic- and Romance-speakers' language and in the adult grammars of those languages*—in children's grammars, RIs are matrix verbs, while in adult language the contexts in which they are found are severely restricted (e.g., in the English, 'Why **leave** the oven on?'), which makes children's exposure to them unlikely. In turn children would not receive input *in either language* that could serve to negatively reinforce a child-like mis-analysis.

Therefore, even though both Germanic- and Romance-acquiring children pass through a stage in which root infinitives are used excessively, and even though Germanic and Romance adult languages disallow root infinitives except in very restricted contexts, Hulk and Müller claim that the near absence of root infinitives whatsoever in the adult grammar means that neither language's input would serve to reinforce an ungrammatical option in the other language. The prediction of a lack of cross-linguistic influence in this domain is borne out: the rate of root infinitive use in German/Dutch is high, just as it is in monolinguals' early speech, but the rate of root infinitive use in Italian/French is low, just as it is, relatively speaking, in the relevant monolinguals' early speech (cf. Legendre et al., 2002).

We can use the two explicit conditions of cross-linguistic influence to understand whether Hulk and Müller would predict cross-linguistic influence in the domain of the development of BE in Spanish-English bilinguals. These are presented in Chapter 1, and I reproduce them here for reference:

[39] Clearly this characterization runs afoul of the one that I have adopted throughout; nevertheless it is worthwhile to adopt it temporarily to peer into Hulk and Müller's account.

(1) *The Interference Hypothesis*

a. Cross-linguistic interference occurs at the interface between two modules of grammar, and more particularly at the interface between pragmatics and syntax in the so-called C-domain, since this is an area which has been claimed to create problems in L1 acquisition also. (Condition A)

b. Syntactic cross-linguistic influence occurs only if language A has a syntactic construction which may seem to allow more than one syntactic analysis and, at the same time, language B contains evidence for one of these two possible analyses. In other words, there has to be a certain overlap of the two systems at the surface level. (Condition B) (Müller and Hulk)

The first condition—the requirement that there be surface overlap between the two languages—is easily satisfied between Spanish and English. Both languages are SVO, and while Spanish does frequently permit VSO/VOS orders, a parallel option (lacking an object, naturally, but with an overt predicate adjective) is marked for predicative sentences, as in (66-67), drawn from López-González (2010, her (65-66)).

(66) a. ? Es Pedro inteligente
is Pedro intelligent

b. ? Es inteligente Pedro
is intelligent Pedro

(67) a. ? Está Pedro enfermo
is Pedro ill

b. ? Está enfermo Pedro
is ill Pedro

López-González observes that speakers of different dialects of Spanish have different judgments about which of the examples in (66-67) are perfectly natural and which ones are marked (the '?'s in (66) are from Mejías-Bikandi (1993) while those in (67) are from López-González herself). The unmarked order for these predicative sentences, however, is unquestionably SVO ('SVPred'). Yet the fact that Spanish utterances with BE can be realized with a null subject, and are any time that the subject can be inferred from the discourse, suggests that perhaps there is not a sufficient amount of surface overlap between the overall structure of predicative sentences in Spanish and in English to cause the grammar to identify them as underlyingly the same. Nevertheless, with respect to the relationship between the BE verb and the predicate, surface overlap (i.e., the ordering of the constituents on the surface) is probably reliable enough that we can hypothesize that this condition on cross-linguistic influence is satisfied.

Turning now to the second of the conditions proposed by Hulk and Müller, we must determine whether the use of BE involves an interface between two modules of grammar to the extent the authors intend. The logic of this condition derives from children's difficulty in applying rules that pertain to interfaces, i.e., even when they have mastered a type of grammatical representation they may not always apply it appropriately because its licensing conditions depend upon an external module of grammar. If the interface constraints *differ* across the two languages, then this only compounds the learning problem, Hulk and Müller contend. As we have seen in the explanations from Becker, there is a strong claim to be made that at least in children the frequent omission of BE may be attributable to the interface between the syntax and conditions of the discourse.

When the authors affirm that the interface condition is satisfied for the root infinitive case discussed above, they do so on the grounds that children have overly generous licensing conditions, deriving from the discourse, that allow them to overuse RIs. By extension, the errors of BE omission that Becker and others have documented, too, result from an erroneous mapping between discourse licensing conditions and elements of the syntax. It is true that the evidence about Spanish monolingual acquisition of BE is more mixed than the evidence about English. But the hypothesis relevant to both languages and phenomena is that children's BE use is distinguished from that of adults because children have not mastered the Temporal Anchoring Constraint, which would force a tense operator to check discourse features. Children instead, in a non-target fashion, allow an aspectual feature to anchor the utterance to the discourse.

Thus if mastering the TAC constraint were key to using BE in an adult-like way, then in fact it seems that this condition on cross-linguistic influence would also be satisfied in the case of children acquiring Spanish and English simultaneously. As both conditions that Hulk and Mueller propose in predicting negative cross-linguistic influence are met by the phenomena that have been discussed in this chapter, their account effectively predicts a delay in these bilinguals' development of BE, which as we have seen is not at all the case.

What is also not clear from this account is how to predict the directionality of (negative) influence (i.e., which language should influence which?): both Spanish and English possess some potentially confounding characteristics that lead us to expect, on this hypothesis, that the acquisition of BE in either language could be slowed. The difficulty that English may pose in being acquired by a bilingual, simultaneously with Spanish, is the extremely high rate of BE omission that we see in monolinguals: this plausibly indicates that in English a target-like mastery of the Temporal Anchoring Constraint emerges late. The appropriate mapping of the utterance into the discourse, posing such a challenge to English monolingual children, may mean that anyone acquiring English, whether by itself or alongside another language, will be delayed in mastering that mapping. On the other hand, the fact that Spanish has two BE verbs that map onto different functions, and yet do not map in a one-to-one way into the two options that children seem to possess for checking temporal anchoring, may lead us to predict that children will even more frequently omit BE in English, since in that language they have no cues to temporal anchoring.

Therefore, the Hulk and Müller account both makes the wrong qualitative prediction, in that it predicts interference or delay rather than facilitation—and the prediction itself is underdetermined precisely because of the particular contrasts involved in the Spanish-English pair. Fortunately it has been possible to develop another, more formal account that fits the facts and makes the right series of predictions; in the next chapter we will see that the OT implementation of the integration hypothesis is capable of handling a more challenging phenomenon as well.

2.10 Conclusion

In the service of testing the viability of the integration hypothesis of bilingual grammatical architecture, in this chapter I have explored in detail the patterns of BE development in English and Spanish, and in both of those languages in the productions of bilingual children who acquire them simultaneously. I showed that the error patterns attested in English monolingual children could be explained in OT terms—crucially without making any modifications to the general architecture, by adopting an independently-motivated series of strategies including local conjunction of ECONOMY constraints and partial rankings. I then investigated the production patterns of Spanish-English bilingual children with respect to BE and to NRFs, finding facilitated development of both, as predicted given the explanation of the monolingual English errors and their virtually error-free monolingual Spanish counterparts. Such facilitation is not predicted on alternative accounts of cross-linguistic influence, such as that of Hulk and Müller (2000) or Paradis and Genesee (1996). Finally, by introducing a series of innovations into the architecture to explain bilingual acquisition that nevertheless are not out of character for Optimality-Theoretic explanations, I captured the (exceptional) facilitated development of English BE alongside the (typical) target-like development of Spanish BE using a single ranking.

This chapter has served as a proof-of-concept that cross-linguistic facilitation can be explained on the basis of a single bilingual grammar, but it is only the beginning, for the relevant constraints here had the same violation profile across the two languages. It was in some sense thus a matter of uncovering what commonalities there were between the English errors and the Spanish target productions in order to establish the single grammar from which both could in principle be—but are not in fact—generated, given the rapid demotion of the *F MARKEDNESS constraints as evidenced by the parallel findings of facilitated BE *and* NRF development. In the next chapter, I move up another level of functional structure, into the C-domain and specifically onto *wh*-questions, which have a distinct structure across the two languages but nevertheless interact in development.

Chapter 3

Facilitation in CP: *Wh*-questions

3.1 Structural development and transfer

While the building blocks of language are universal—every language makes use of certain grammatical categories such as 'subject' and 'verb', for instance, and every language uses verb phrases—the way in which a particular language combines those building blocks into sentences can vary a good deal (although within limits imposed by Universal Grammar: e.g., Cook and Newson, 2014). For example, some languages require an overt subject for an acceptable declarative sentences (e.g., English: Sam drinks milk) while other languages do not (e.g., Spanish: *Toma* 'he-drinks' *leche* 'milk'). A crucial implication of this type of cross-linguistic difference is that with the same degree of grammatical development—the same number of available functional projections, for example—children acquiring different languages will be capable of producing functionally analogous constructions with varying degrees of accuracy. Take our 'Sam drinks milk' utterance as a toy example. If that is the proposition that a child wishes to express, but in her underdeveloped grammar she can only merge a verb and its complement, then in English she might produce 'Drinks milk' even though she intends the full proposition, with the subject specified. The child has a full proposition in mind—but in English she cannot express it in an adult-like way. Such cross-linguistic contrasts are a direct prediction of the gradual structure-building hypothesis, in which children start out with a limited amount of structure in which to house lexical categories and gradually develop more in response to linguistic input.

This chapter explores the implications of a real example of the difference that structural availability can make in the utterances that children are capable of producing over the course of development. At the two- and three-word stages in development, Spanish monolingual children have been shown to produce target-like *wh*-questions (as in (68) Pérez-Leroux and Dalious, 1998), but in the same stages English monolingual children make systematic errors (as in (69) Smallwood, 1997; Rowland et al., 2005).

(68) cómo dice el gato
how says the cat?
'What does the cat say?' (Juan, age 2;04— Hernández-Pina, 1984)

(69) and what *(do) they say on the front? (Gail, age 2;10— Theakston et al., 2001)

Pérez-Leroux and Dalious (1998) argue that surface error differences that monolingual children acquiring these two languages produce are attributable to those children having access to *the same amount* of abstract syntactic structure: in Spanish, structure only through TP is sufficient to get the target order to emerge, but in English having a TP as the highest level of structure available cannot give rise to a target *wh*-question (given the requirement that the *wh*-phrase raise to SpecCP and the auxiliary to C^0).[1] It is this observation that I

[1] The relevant tree structures are provided and discussed in §3.2.2.

build on here, entertaining the predictions that each hypothesis of bilingual grammatical architecture makes about the *simultaneous* acquisition of these two systems.

When children acquire both Spanish and English at the same time, as in the case of bilingualism, it may be expected that their course of acquisition of *wh*-questions in each language would parallel that of monolinguals in each of their languages, following the many findings of a lack of cross-linguistic influence as documented in the introductory chapter. This is certainly the prediction that would follow from the isolation hypothesis, each language's grammar developing at the monolingual rate. Specifically, in Spanish, *wh*-questions would always be target-like. But in English, *wh*-questions would display the same range and frequency of errors as monolingual English-speaking children's *wh*-questions do—or perhaps more, given the more limited English input that is available to a child acquiring two languages in the period of time in which a monolingual child must acquire only one.

In this chapter I examine this prediction and find that it is not borne out in corpus data.[2] The data overall support an alternative prediction, of facilitation in the development of *wh*-questions in the English of Spanish-English bilinguals—that is, the Spanish-English bilinguals produce fewer errors of the sort that are systematically found in monolinguals' speech. That facilitation is evident in these data supports the integration hypothesis that was discussed conceptually in the Chapter 1 and first developed formally in Chapter 2.

With these *wh*-question data and the general hypothesis in hand, I expand on the integrated architecture in the OT framework, elaborating the conception of *input tagging* to introduce tagged *constraints*. These serve to limit the effect of *constraint splitting*, which

[2]Experimental data, which I present in the next chapter, mirror the corpus data in one important regard and diverge from it in another.

crucially permits the architecture to explain the existence of utterances that embody parametric contrasts (between the speaker's two languages) but does not violate the universality of the constraint set.

The chapter is organized into the following sections. After the close of this introduction, in the second section, §3.2, I present the relevant facts of English and Spanish *wh*-questions in monolingual acquisition. I describe the difference in error rates and error types that are found in the speech of English and Spanish monolingual children, and then provide the *adult* structures of *wh*-questions in each of these languages in order to show the degree of difficulty the target grammar poses for the child. In the third section, §3.5, I present the OT analyses of the monolingual adult *wh*-questions and of monolingual children. This section includes a discussion, along lines similar to those in the previous chapter's §2.4.1, of the *optionality* evident in children's errors. In the fourth section, §3.4, I present corpus data on the acquisition of *wh*-questions by Spanish-English bilinguals, showing that in this population target-like mastery of English *wh*-questions is acquired significantly earlier than it is in comparable English monolinguals. Following the presentation of these data, §3.5 presents their interpretation in the Optimality-Theoretic terms, which extends the OT account of facilitation first proposed in the previous chapter into this new, more challenging domain—more challenging to the formalism precisely because the underlying structures of Spanish and English *wh*-questions do not neatly overlap in the way that the copula structures did. A conclusion entertains additional predictions made by the account.

3.2 Acquisition of *wh*-questions in monolinguals: English vs. Spanish

Before we can explore the patterns of *wh*-question acquisition in Spanish-English bilingual children, we need to establish the relevant *monolingual* baselines. In this section I therefore review in some detail what is known about Spanish and English monolingual children's development of this type of utterance. By then viewing children's patterns of production in light of the *target* structures that speakers of each language ultimately acquire, we will see that English-acquiring children produce certain kinds of errors that are related to what competence is required in order to generate a *wh*-question in English—certain grammatical transformations and a large amount of abstract structure are needed to satisfy the constraints operative in English questions, and as we saw in the previous chapter, large structures can be difficult to represent early in development.

3.2.1 Attested patterns in development

I begin with monolingual English acquisition of *wh*-questions and then turn to Spanish. While English-speaking children produce some target-like *wh*-questions from the very beginning, they also often produce *wh*-question that omit obligatory constituents like the auxiliary verb (70a) or both the auxiliary and the subject (70b), or that do not reflect target word-order (70c) or inflectional patterns (70d) (Brown, 1973; Klima and Bellugi, 1966).

(70) a. where (*has the) other one gone? (Manchester, warr14b.cha—MLU 2.98)

b. what (*are you) doing over there? (Manchester, becky21a.cha—MLU 2.85)

c. why *it's all gone? (Manchester, liz12a.cha—MLU 2.42)

d. why did it *frightened you? (Manchester, becky18a.cha—MLU 2.78)

The errors in English-speaking children's speech are not random, however. Several distinct but potentially related errors characterize these *wh*-questions (Rowland et al., 2005). The most common such error is omission of the *auxiliary* element, required in all English *wh*-questions except for subject questions (*Who *(did) stole the cookies from the cookie jar?*) and copula questions (*Which cookies are still warm?*). These auxiliary-omission errors accompany other divergences from the adult grammar, such as non-adult-like subject pronouns (e.g. '*where* me *sleep?*') or non-inverted orderings of subject and inflected verb (e.g. '*where small trailer* he should *pull?*').[3]

There are arguably bases in both representation and processing that may give rise to the contrast between the patterns observed in English and those observed in Spanish. Goodall (2007), for example, claims that for English *wh*-questions the presence of a preverbal subject has a less magnified, and so less disruptive, effect on processing than it does for Spanish *wh*-questions, for two reasons. The first reason is that in English, preverbal (overt) subjects are the default option for virtually all utterance types, i.e. there is no op-

[3]It should be noted that *subject wh*-questions are not typically included in calculations of English monolingual children's *wh*-questions in acquisition, with the implicit assumption that they should not pose the possibility of errors that all other *wh*-question types do—given that they do not require aux-insertion, nor inversion, as just mentioned in the main text. However, in a search through the Manchester corpus of English monolinguals, I did locate a small number of errors in subject question productions. A series of examples are in (1).

(1) a. *Aux omission:* who (*has) got this? (becky12a)
b. *Aux omission or incorrect form:* who done [*] this? (nic29a)
c. *Agreement morphology omission:* who like(*s) fruit? (becky17b)
d. *Do-support commission:* who did [*] make it? (becky21b)

What such errors suggest is that not even subject *wh*-questions are immune to the production errors that other *wh*-question types exhibit; for the most part they would seem to have the same basis: in failures to overtly realize tense/agreement.

tionality related to whether to have an overt or a null subject in matrix clauses of nearly any kind. Without a need to entertain pragmatic constraints, the inclusion of an overt subject is uncomplicated—it is the default. The second reason is that whether the subject precedes or follows the finite verb (i.e. the auxiliary) does not affect the distance of the gap from its *wh*-filler. Therefore on processing grounds alone there is no advantage to producing a (correctly) inverted *wh*-question, for a child acquiring English.

Beyond Goodall's (2007) discussion of a lack of processing advantage to inversion in English, a number of other distinctions between the two languages make it straightforward to predict that English *wh*-questions would pose a greater acquisition problem than Spanish ones do. First, the English-acquiring child must master raising the subject DP from SpecVP to SpecTP in order for the subject to get nominative case (e.g., to be converted from the default 'me' into the subject-appropriate 'I'). As Vainikka (1993) documents, the oblique case-marking (e.g., 'me' instead of 'I') that is found in English-acquiring children's early declarative sentences persists in later *wh*-questions, even after in declaratives children regularly do assign nominative case to subjects.[4]

Second, the child must raise the auxiliary from T^0 to C^0, or insert a 'dummy do' and raise that. Head-movement (represented by the t_v in the tree diagrams in §3.2.2) is less common in English than in Spanish, and it must be learned that T-to-C movement occurs in the context of a question instantiated as the presence of a [+Q] feature. The C-domain is notoriously vulnerable to weaknesses of any kind—to being acquired in an L1, an L2,

[4] Vainikka (1993) claims that this finding poses a challenge to the account she offers there, but it is probably readily explained once processing demands (e.g. restricting total derivational complexity of an utterance) are taken into consideration. In any case, in the corpora I study here, and those ones the analyses of which I compare my corpora to, this issue of oblique case is so marginal that I will not address it in my analyses.

or with Specific Language Impairment (SLI); to being maintained in the face of Broca's aphasia (Platzack, 2001)—and the fact that both the *wh*-phrase and the inflected auxiliary must settle there may give rise to errors. Add to this the requirement to add a lexical item that does not contribute to the interpretation of the utterance and the difficulty becomes clear.

Finally, the English-acquiring child must learn to raise the *wh*-phrase from its base-generated position to SpecCP. Pozzan (2011) claims that English learners, both L1 and L2, are quick to acquire the knowledge that *wh*-phrases must be located clause-initially; both groups virtually never err by leaving the *wh*-phrase in situ (Kellerman, 1979; Batmanian et al., 2008). So while it was claimed above that *wh*-movement itself is acquired early, perhaps it is instead the clause-initial position that is early acquired—and it may be the case that needing to raise the subject DP to SpecTP as well as the *wh*-phrase to SpecCP overwhelms the child's capacity for phrasal movement, increasing the overall processing load even though the child does usually succeed in raising the *wh*-phrase.

Given the greater derivational complexity of the English *wh*-question, involving several movement operations of different types, it is unsurprising that Rowland et al. (2005) find a series of errors that can for the most part be attributed in some way to the movement (and dummy element insertion) requirements of this utterance type (pp. 390–391).

(71) Errors of omission

a. Auxiliary/copula omission: Errors where the auxiliary/copula was omitted and tense was not overtly marked on the lexical verb (e.g., where he going?, where he go?, where that?).

b. Subject omission: Errors with omitted subjects (e.g., where's going?).

c. Subject + auxiliary/copula omission: Questions with auxiliary/copula and subject omitted (e.g., where going?).

(72) Errors of inversion

a. Double marking errors: These errors included doubling of the auxiliary/copula (e.g., where does he does go?), errors in which tense and agreement were correct but were marked on both auxiliary and lexical verb (e.g., where does he goes?), and errors in which an auxiliary was present but tense and agreement were marked only on the lexical verb (e.g., where do he goes?).

b. Raising errors: Errors in which the auxiliary was omitted and tense and/or agreement remained on the lexical verb (e.g., where he goes?). These errors were coded as inversion errors as they indicate that the child has failed to raise tense and agreement.

c. non-inversion errors: Subject auxiliary/copula inversion error (e.g., where he does go?).

(73) Agreement errors: Errors in which an auxiliary/ copula was present but did not agree with the subject (e.g., where does you go?, where do he go?).

(74) Case errors: Errors in which the subject had incorrect non-nominative case (e.g., where's her going?).

Not all of the errors sought by Rowland et al. (2005) are attested at the same frequency, as is evident from Figure 3.1, displaying the frequency of errors produced by 12 children in the Manchester corpus in CHILDES (MacWhinney, 2000).

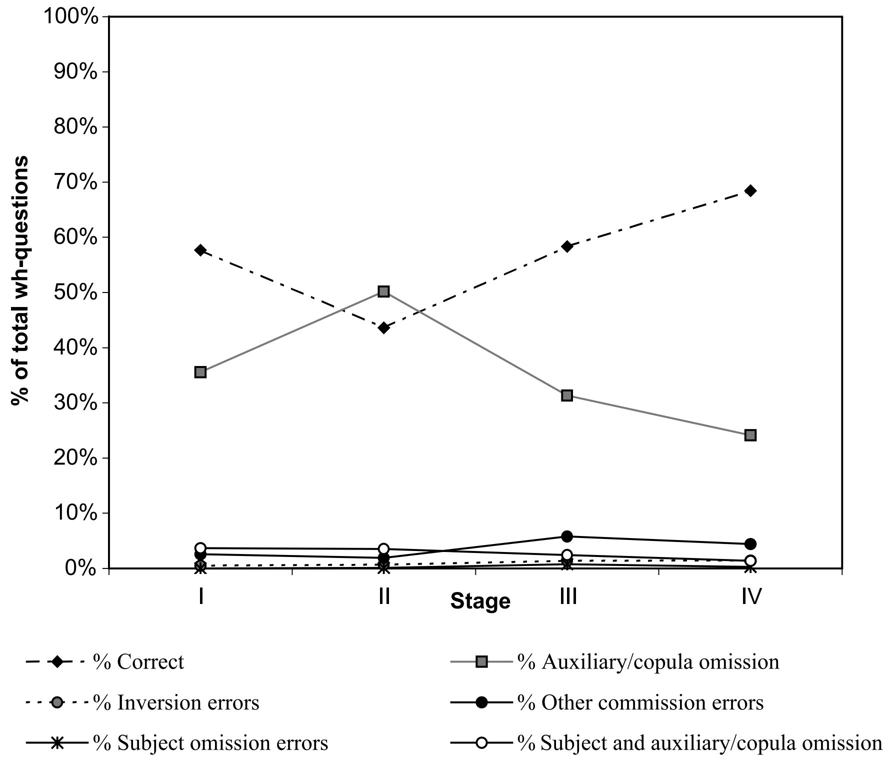


Figure 3.1: Overall error rates documented in the Manchester corpus by Rowland et al. (2005, Figure 1, used with permission from ASHA)

The majority of errors found by Rowland et al. (2005) are errors of omission, either of the auxiliary or of the copula; other errors, relating to inversion, subject omission, and other types of commission are far more infrequent and on average do not account for even 10% of the English children's productions. This is approximately in line with the older dissertation work of Stromswold (1995), which analyzes data from another 12 monolingual English-acquiring children (this time American rather than British) in CHILDES: she documents a range of 54%–98% of *wh*-questions lacking inversion, but with a median correct-inversion rate of 95% (i.e., a small subset of children frequently did not invert, but most children almost always did). Stromswold, however, omits from her analysis all utterances in which the auxiliary was absent, so naturally no conclusions can be drawn about that type of error from her study.

Another set of data on the acquisition of *wh*-questions in English comes from elicitation studies (Bellugi, 1971; Erreich, 1984; Sarma, 1991; Ambridge et al., 2006; Pozzan, 2011). In such tasks, experimenters elicit child *wh*-questions by developing stories that can contextualize the request that the child ask a question. Typically, a small number of characters are introduced to the participant, and her task is then to solicit information *from* one of the character *about* another one. The older experimental elicitation studies (Bellugi, 1971; Erreich, 1984; Sarma, 1991) turned up a large proportion of non-inversion errors in their child responses (e.g., of 58 responses in one of Sarma's experiments, 23 did not display inversion), in all likelihood because of their stimulus stories. In order to set up the context adequately the stories contained embedded (non-inverted) versions of the target matrix *wh*-questions that children were expected to produce—and probably primed the children to produce the same non-inverted questions when it became their turn:

(75) In this story we have a dog named Pluto. Now, Pluto has all kinds of ways to go to his friend's house. He can go by truck, or he can go on a bike, or he can go on roller skates. Today, he wants to go on roller skates. So, <u>we know which way Pluto can go to his friend's house</u>. Ask Mickey which way. (Sarma, 1991, p. 94)

Lower rates of non-inversion have been found in subsequent elicitation studies, as in Pozzan (2011), off of which my own experimental task is modeled, and to the results of which I will compare my own as well. Pozzan eliminated the potentially misleading embedded *wh*-question from her prompts, and found that her English monolingual child participants (mean age = 4;3, range = 3;3–5;9) produced fewer than 5% of their *wh*-questions without inversion; her auxiliary omission rates are similarly low. I provide more detail about her study and results when I discuss the elicitation data collected for my dissertation. Nevertheless, with this background laid out, it should be clear that the major issue for English monolingual children is of omission of the auxiliary or copula, followed by non-inversion of the subject and the auxiliary; other errors, while notable, are not nearly as pervasive, so I focus primarily on those two types of errors in my analyses.

What we can take from these data on English *wh*-question acquisition is that a child acquiring this language may experience representational or processing difficulties, leading to the systematic production of erroneous forms. Before turning to bilingual acquisition of English *wh*-questions, I provide a more concrete account of the differing developmental requirements facing speakers of each of these languages by examining their target structures explicitly.

3.2.2 English target analysis

The analysis of *wh*-questions in adult English entails that an auxiliary element, if present, raises from T^0 to C^0, and if absent, is inserted in the form of a 'dummy do' in T^0, having been selected by the [+Q] feature housed in C^0. The auxiliary then raises to C^0, while the subject raises from SpecVP to SpecTP. There is the additional confounding element of the *wh*-word (or phrase), which is base-generated according to its role in the sentence's argument structure. See, as an example, the argument *wh*-phrase that refers to the direct object of a transitive verb, shown in Figure 3.2.

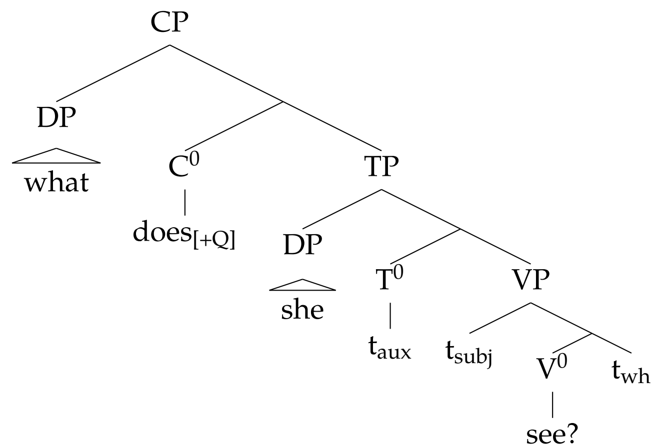


Figure 3.2: Argument *wh*-question: English abstract representation, 'What does she see?'

The *wh*-phrase must undergo movement from its base-generated position as sister of V^0 to the SpecCP position which is required of it by the *wh*-Criterion (Rizzi, 1996), reproduced in (76).

(76) The *Wh*- Criterion:

a. A *Wh*- operator must be in a Spec-head configuration with X_{+WH}.

b. An X_{+WH} must be in a Spec-head configuration with a *Wh*- operator.

Mastery of these multiple steps, and obedience of the *wh*-criterion, appear to be necessary in order for a target English *wh*-question to be produced.

3.2.3 Spanish acquisition

In contrast to the errors that monolingual English-acquiring children often make, children acquiring Spanish are known to produce target-like *wh*-questions from the earliest two-word stages (Serrat and Capdevila, 2001; Pérez-Leroux and Dalious, 1998; Villa-García and Snyder, 2009):

(77) a. dónde está el nene? (age 1;9—MLU 2.26)
where is the boy?

b. qué está haciendo Mamá? (age 1;11—MLU 2.33)
what is doing Mama?
'What is Mama doing?' (Ornat corpus, CHILDES)

(78) qué va a hacer el papá? (age 2;4.18—MLU 2.77)
what goes to do the dad?
'What is Dad going to do?' (Montes corpus, CHILDES)

Goodall (2007) argues that the target-like production of *wh*-questions by Spanish monolingual children—and by Italian, Catalan, and European Portuguese monolingual children—"could be no other way," given some uncontroversial assumptions about the grammar and processing of these languages. He observes that a preverbal subject in a Spanish *wh*-questions would increase the distance between the *wh*-filler and the gap in which it must be interpreted and notes additionally that overt subjects have been argued to be hard to process in general, relative to objects (Clark and Wasow, 1998; Kluender, 2004). For Spanish specifically, this would make non-inverted, i.e. '*wh*-word–subject–verb', *wh*-questions more difficult to process than inverted ones—especially in light of the fact that Spanish subjects can generally be null or overt and preverbal or postverbal, contingent on mostly pragmatic factors that may be later to develop in young children. (Davidson, 1996; Grinstead, 1998, 2004). The final pieces of Goodall's argument are that in Spanish children have V-to-T movement in place by the time they produce two-word utterances (79) and that across languages children seem to "set the *wh*-movement parameter" early (Van Kampen, 1997).

(79) *Simultaneously occurring SV–VS options, the latter showing V-to-T, in early child Spanish, from Villa-García and Snyder (2009)*

a. (a)a pipi n(o) (es)tán
   the pee not are
   'The pee is not here' (Magín, Aguirre corpus, age 1;07)

b. (n)o (es)tá la f(l)or
   not is the flower
   'The flower is not here' (Magín, Aguirre corpus, age 1;08)

Thus, having mastered *wh*-movement and V-to-T movement early—and strongly dispreferring a preverbal subject, especially one that would elongate a filler-gap dependency—Spanish children cannot help but produce target *wh*-questions from the beginning.

3.2.4 Spanish target analysis

Determining what structure underlies Spanish children's *wh*-questions is less straightforward than their accurate productions might suggest. Various proposals for the abstract representation of Spanish *wh*-questions can be found in the literature, each respecting some but not all of the 'universal' constraints that could bear on this kind of utterance, and because there are fewer lexical items in Spanish *wh*-questions, there are more options—from the standpoint of the theory—regarding where each head and phrase surfaces, as well as how much structure is projected. Here I review three prominent proposals: the first preserves the Wh-criterion of Rizzi (1996), the second incorporates facts about Spanish not obviously related to *wh*-questions, and the third is a maximally economical structure. To foreshadow the result of this presentation: while all three structures have their plausibility, in the current account I adopt a version of the third, economy-respecting structure (due to Baković, 1998), given that it is an economy-based theory of representations—Optimality Theory—that my formal proposal embodies.

Raising to CP

One possibility for Spanish *wh*-questions is that they are formed in almost the same way as English ones, with the *wh*-phrase raising to SpecCP and the finite verb raising to C^0 (Rizzi, 1996; Guasti, 1996a). If the Wh-criterion, as stated in (76), is to be strictly observed in Spanish, then the same movement and checking operations apply as in English, except that it is the lexical verb that raises all the way from V^0 to C^0 (passing through T^0), rather than the auxiliary raising from T^0 to C^0. However, it is frequently assumed that Spanish subjects (and those of other Romance and/or rich agreement languages) do not raise to SpecTP to get nominative Case; instead the rich agreement checks Case and allows the subject DP to stay in situ in SpecVP (Barbosa, 1995; Pollock, 1997; Alexiadou and Anagnostopoulou, 1998), thus further distinguishing the structure of the Spanish *wh*-question from that of the English *wh*-question, as in Figure 3.3. The structural option discussed in this subsection and the alternatives to be discussed subsequently will be represented by the example sentence in (80).[5]

(80) Qué ve (ella)?
what.3s (she)
'What does she see?'

[5] The subject is represented here parenthetically because I am assuming that the subject is a topic, and therefore would be omitted (i.e., would be *pro*) in a *wh*-question like this one. It is best not to omit the subject entirely in this example, however, because in the upcoming discussion the issue of pre- and postverbal subjects in Spanish *wh*-questions will arise, in which case an overt subject must be supplied.

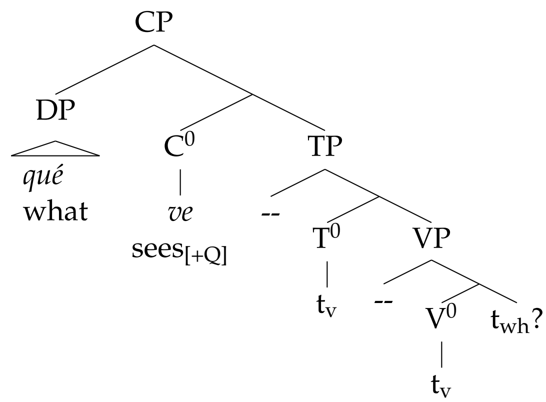


Figure 3.3: Argument *wh*-question: Spanish-*qua*-English

While a close match between English and Romance *wh*-questions has some motivation, to posit that the structure of matrix *wh*-questions is the same for these two classes of languages ignores some crucial differences between them. First, in Spanish several types of constituents, including <u>clitics</u>, **negation**, and some *adverbials*, obligatorily precede the verb (but follow the *wh*-word):[6]

(81) Qué *aún* **no** <u>le</u> dio Mafalda a su mamá?
what still not to-her gave M. to her mother
''What did M. still not give her mother?' (from Suñer, 1994)

The fact that, e.g., negation and adverbs can intervene between the *wh*-word and the verb is significant because both of these constituents are typically taken to make use of their own projections, negation requiring a NegP and adverbs an AdvP. Since both of these projections have been argued to occupy fixed positions in between TP and CP, that the lexical verb follows them shows that the verb itself has not raised to C^0 (Rivero, 1989; Suñer, 1994).

[6]Clitics alone would not make for a compelling case for a lack of T-to-C raising given that they may incorporate to the verb (e.g., Uriagereka, 1995).

Further arguments in favor of the claim that Spanish verbs never raise to C^0 come from the variation in inversion requirements for *wh*-questions, namely the argument-adjunct distinction in which adjuncts in Spanish abide non-inverted subject-verb order (Baković, 1998) (82); sluicing effects in which the higher predicate licenses *wh*-phrases in the lower one (83); and left-dislocation of objects which, even in *wh*-questions, precede the verb but follow the *wh*-word (84).

(82) a. Qué cocinan los padres?
what cook the parents
'What are the parents cooking?'

b. Por qué los padres cocinan eso?
why the parents cook that
'Why are the parents cooking that?'

(83) Este verano leí varias novelas, pero no recuerdo cuántas.
this summer read.1s.PST various novels, but not remember.1s how-many
'This summer I read various novels, but I don't remember how many.' (Suñer, 1994, p. 349)

(84) Por qué a Paco ya no lo aguanta nadie?
why Paco.DAT already not him.CL stand nobody
'Why can't anyone stand Paco already?' (Suñer, 1994, p. 351)

Pérez-Leroux and Dalious (1998) and Barbosa (2001), among others, point to additional reasons to reject T-to-C movement for Spanish *wh*-questions. In particular, while English has a matrix/embedded clause distinction in terms of subject-verb inversion in *wh*-questions (85), Spanish has no such asymmetry (86)—a fact which is not captured if T-to-C movement is posited for Spanish. Additionally, in order to accommodate Spanish to the *wh*-criterion, Rizzi and Guasti must apply it to embedded clauses as well, which conflicts with the original formulation of the criterion; on the basis of this fact and the position of adverbs and negation presented in (84) above, Guasti (1996b) abandons V-to-C movement in her analyses of Spanish. With such a consensus formed around this analysis, it is typically supposed that the Spanish verb always and only raises to T^0, even in *wh*-questions.

(85) a. Why **did** *Ana* **plant** those daisies?

b. I know why *Ana* **planted** those daisies.

(86) a. Por qué **sembró** *Ana* esas margaritas?
why planted Ana those daisies

b. Yo sé por qué **sembró** *Ana* esas margaritas.
I know why planted Ana those daisies

Partial raising to CP

If Spanish verbs only raise to T^0, a more plausible structural analysis of *wh*-questions is the one shown in Figure 3.4. This hypothesized structure reflects the analysis of Ordóñez (2000) in which postverbal subjects in Spanish are base-generated in, and remain in, SPECVP. In declaratives, preverbal subjects on this analysis, and on other analyses as well (e.g., Barbosa, 2001; Alexiadou and Anagnostopoulou, 1998), are located in the left periphery, in, for example, the specifier position of TOPP, which is lower than the CP that houses the [+Q] feature.[7]

[7]Condition (b) of Rizzi's *wh*-criterion is not properly satisfied by this structure, an issue that is not taken as dire by its original proponent, (Ordóñez, 2000), nor by subsequent adopters.

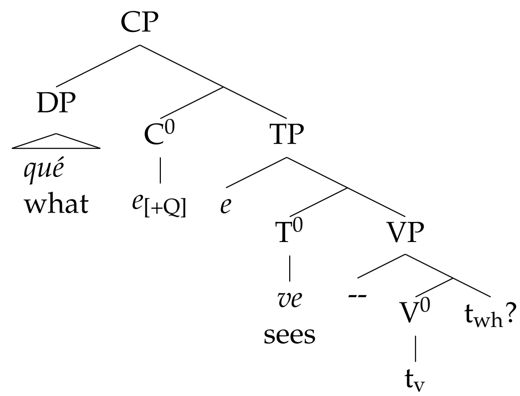


Figure 3.4: Argument *wh*-question: Spanish with empty C

The argument of the verb often attributed to *pro* is instead instantiated in person agreement on the verb itself (cf. Platzack, 2004), which permits an overt subject to surface in a variety of positions without creating an environment where there is no argument to occupy the 'agent' (or other subject-related) theta-role. An overt subject, when it is postverbal, is generated *and surfaces* in SpecVP, while preverbal subjects are base-generated in the same position and then raise up to SpecTopP. It is the fact that preverbal subjects are located in the left periphery that excludes the possibility of an overt subject intervening between the *wh*-word and the finite verb: a CP with a [+wh, +Q] feature bundle (the [+Q] in C^0, the [+wh] in SpecCP), creates an incompatibility with a specified TopP because Topic phrases are [–Q], as in Figure 3.5.

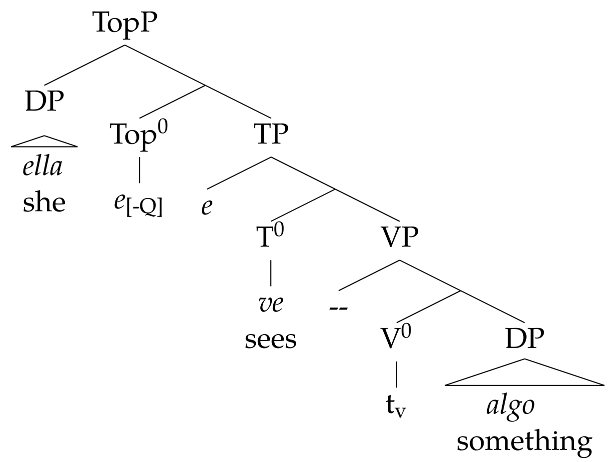


Figure 3.5: Spanish declarative, TopP incompatible with CP

Given this incompatibility it is impossible for the subject to raise to a Topic position, hence it cannot appear preverbally. But this analysis should not be viewed as evidence that approaches with an ‘exploded CP’, like the cartographic approaches of Rizzi (2004); Cinque and Rizzi (2008), should be rejected—because it is not the case that all features that cause constituents to raise into the C-domain are incompatible with the [+Q] feature. This is merely a characteristic of the [+top] feature, which *by stipulation* cannot co-occur with [+Q], and which explains several otherwise challenging facts about the position of the subject in matrix vs. embedded *wh*-questions Ordóñez (see 2000, chapter 4, for examples)—but it does not go to rule out contrastive focus or other fronting operations. As such this analysis preserves the systematic inversion of Spanish *wh*-questions while respecting the data that indicate that verbs do not raise out of TP into CP.

No projection of CP

A final, even more economical account of Spanish *wh*-questions has been proposed by Baković (1998), primarily to explain the differences in inversion patterns across Spanish dialects. His work, along with that of Suñer (1994) and Goodall (1991), has documented a variety of Spanish dialects in which inversion in *wh*-questions is not required with all *wh*-words. Some dialects split the inversion/non-inversion requirement along the argument/adjunct divide, but additional dialects exist along the same continuum, always requiring inversion with the more argumental *wh*-words and not requiring inversion with the more adjunct-like ones.

Baković (1998) captures this inversion/non-inversion distinction with an Optimality-Theoretic analysis that involves only the amount of structure that is required to make that distinction go through: notice that in, for example, the Spanish structure as presented in Figure 3.6 has a whole projection with no overt material, namely its TP. In contrast, in an economy-based theory of representations like OT, additional structure incurs a cost that can be fatal to a representation if that additional structure does not go to satisfy other, higher-ranked constraints. A freer mapping from *wh*-phrases to any highest specifier (i.e., operator) position results in the structure in Figure 3.6.

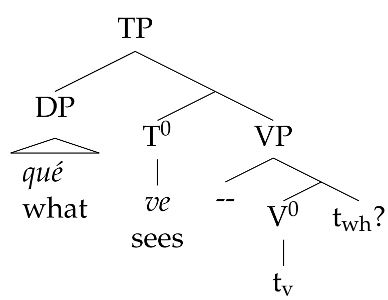


Figure 3.6: Argument *wh*-question: Spanish with only TP

With this structure proposed for argument *wh*-questions, for those dialects of Spanish that do not invert some of their *wh*-questions, the structure involves the *adjunction* of the *wh*-word to VP, deriving the order *wh*-phrase-subject-verb-object, as in Figure 3.7.

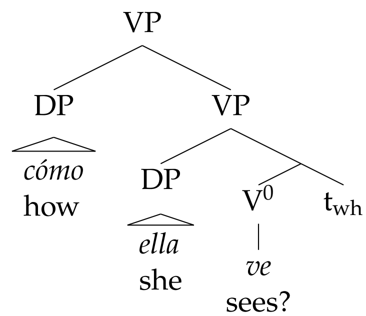


Figure 3.7: Adjunct *wh*-question without inversion: VP-adjunction

The difficulty with this account, as Gutiérrez-Bravo (2013) observes, is that it is implausible that there is really so minimal a structure for rich-inflection languages, especially those where it is clear that raising out of VP is obligatory (cf. Pollock, 1989). If, however, we draw a principled distinction between the VP projection and a TP projection, and require that finite verbs raise from V^0 to T^0 in rich-inflection languages, we can preserve the spirit of the Baković (1998) analysis by proposing that the adjunction takes place at TP for those Spanish *wh*-questions that do not display inversion. In this instance, we would always have verb raising, as is independently desirable for Spanish. A consequence of adopting this very analysis, however, is that we would also be positing that the subject DP must raise to SpecTP, at least in the non-inverted questions. Raising subjects to SpecTP only in adjunct *wh*-questions is something that to my knowledge has not been independently motivated in the literature, and for that reason should be viewed with caution.

However, the dialects of Spanish that lack inversion in some or all of their *wh*-

questions are not directly relevant to the corpus data and the focus of my facilitation analyses, so while I will address them briefly later, it is clear that the objection mounted by Gutiérrez-Bravo (2013) on this front should not deter us from entertaining a TP-only structure.

We have seen three distinct structural representations that have been argued to underlie adult Spanish *wh*-questions: one which mirrors the English *wh*-question structure, a second that respects some 'universal' constraints on *wh*-questions as well as some Spanish-specific ones, and a third that is maximally economical. Choosing among these is a necessary step in order to be able to articulate predictions for the development of *wh*-questions in bilingual grammar. But rather than make an a priori decision about which Spanish *wh*-question structure to adopt, in the next section I zoom out to the Optimality-Theoretic analysis of the already discussed English representation and the three Spanish alternatives. As we will see, the process of identifying and culling the candidates available for the argument *wh*-question input decides the answer for us about which Spanish representation should be adopted.

3.3 *Wh*-questions in Optimality Theory

Just as in the previous chapter, in order to address *wh*-questions in Spanish-English bilingual development, we need to (a) characterize the input to the optimization of interest, (b) generate the output candidates corresponding to that input, (c) determine what constraints are crucial to the optimization for each language, and finally (d) identify what modifications can be made to the theory so that it can capture two languages within one grammar.

Several constraints that were used in the analysis of the copula will also be relevant here, plus several new constraints that pertain to the larger amount of structure and of movement that are involved in *wh*-questions.

3.3.1 Input, candidates, and constraints

Input

The input that I consider in this discussion is a present-tense proposition: an object *wh*-question with a subject topic, as in (87). Because both monolinguals and bilinguals produce at least some errors when attempting to utter this type of question, it seems an appropriate place to begin the presentation.

(87) <see(x, y), (x = Mommy, y = what), x = topic, y = [+Q]; T = pres>

Given this input, not yet tagged for language (which the bilingual context will require), the winning candidates should therefore have the form in (88), for each language. Tagging the input for language would give rise deterministically to one or the other form in (88).

(88) a. English: 'What does she see?'

b. Spanish: 'Qué ve?'

On the surface these structures appear quite different, but I will argue that they are underlain by a similar constraint ranking, suitably modified for the bilingual acquisition context. The target syntactic structures are presented in Section 3.3.2, along with their violation profiles for the constraints under consideration, but even absent these we can select a subset of of the candidates output by *Gen* to consider when we evaluate possible rankings of those constraints.

Candidates

It is important to include in the candidate set being considered candidates that vary along several dimensions. First, the relevant child forms need to be represented: the null-auxiliary question (without aspect (89a) reflected on the lexical verb, since it is the simple *do*-requiring present being analyzed here), and the non-inverted question with *do* (89b).

(89) a. what you hear? (becky14b, Manchester corpus—MLU = 2.43)

b. what you did do on that page? (2-08-01, Lara-Diary corpus—MLU = 2.64)

The relevant (adult) target structures must be represented among the list of candidates, as well as structures that could underlie each of the child error types. In principle *Gen* generates an infinite number of candidates for a given input, but again, analyses rarely explicitly optimize over all of these possibilities, because there is also a principled way of restricting the number of candidates that need to be considered. The technique, as in the previous chapter, is HARMONIC BOUNDING (Prince and Smolensky, 2004), and it involves evaluating a subset of generated candidates against the constraints that are relevant to those candidates: any candidate α that incurs the same violations as another candidate β, plus some more violations, should be eliminated from the analysis, because it will never win. Therefore in identifying and selecting candidates for the input under consideration, I generate basic structural options allowed by *Gen*, ensuring the inclusion of structures that can represent the child error forms, but restrict the printed options to the needed set plus those candidates that harmonically bound them. The initial list of presented candidates includes structural representations that respect one-to-one mappings between structural positions and arguments (e.g., subjects must surface in SpecTP) and structural representations that exhibit a greater level of economy (e.g., those that contain as little movement or as few projections as possible), having been systematically derived from the English target, which contains the largest number projections and overt heads of the candidates that *need* to be analyzed.

The candidates that could represent the target surface forms for the input in (87) are listed in (90). Candidate (90), which will always be labeled (a), is the English target. The Spanish target is not as easily given a structural representation, and so several candidates can represent it in principle, here reflected in (91); these letter labels will be carried into the harmonic bounding tableau (Tableau 3.1) but not beyond it.

(90) English candidate matching adult targets for input: <see(x, y), (x = Mommy, y = what), x = topic, y = [+Q]; T = pres>

(a) $[_{CP}$ what does $[_{TP}$ she t_{aux} $[_{VP}$ t_{subj} see $t_{wh}]]]$ English target

(91) Spanish candidates (possibly) matching adult targets for input: <see(x, y), (x = Mommy, y = what), x = topic, y = [+Q]; T = pres>

(b) $[_{TP}$ what sees $[_{VP}$ -- t_{verb} $t_{wh}]]$

—*Possible Spanish target, à la Baković (1998)*

(l) $[_{CP}$ what sees $[_{TP}$ subj t_{verb} $[_{VP}$ t_{subj} t_{verb} $t_{wh}]]]$

—*Possible Spanish target, à la Rizzi (1996)*

(m) $[_{CP}$ what sees $[_{TP}$ e t_{verb} $[_{VP}$ subj t_{verb} $t_{wh}]]]$

—*Possible Spanish target, intermediate between Figures 3.3 and 3.4*

(n) $[_{CP}$ what e $[_{TP}$ e see $[_{VP}$ subj t_{verb} $t_{wh}]]]$

—*Possible Spanish target, à la Ordóñez (2000)*

(o) $[_{TP}$ what $[_{TP}$ e sees $[_{VP}$ subj t_{verb} $t_{wh}]]]$

—*Possible Spanish target, adjunction structure, extrapolated from Baković (1998)*

In addition to the possible structural representations corresponding to the target forms, I also include multiple possibilities for each of the child errors, as well as structures that are not attested in the populations currently being discussed but are typological possibilities nevertheless. Rather than list all of these options here, I turn to the constraints that I claim influence the production of *wh*-questions in Spanish and English (in development and in the adult language), which will then allow me to construct a tableau containing *all* of the relevant structural options, and their violation profiles, for the purposes of harmonic bounding and for the subsequent analyses.

Constraints

We turn now to the constraints that impact the realization of *wh*-questions in Spanish and English; most of them are satisfied by the target structures but are either (a) violated crosslinguistically or (b) violated by some of the child winners. Using these and the output of *Gen* we will be able to settle on a final list of candidates, allowing the analysis proper to proceed.

The first set of constraints that are required are broadly related to structure. For the relationship between subjects/agreement and TP, I adopt a somewhat unconventional variation on the EPP, as in (92):

(92) Extended Projection Principle: EPP (Based on Grimshaw, 1997, Subj)

a. *The EPP feature on T^0 is checked.*

b. Satisfied when nominal feature of agreement is checked *either* by verb-raising to T^0 *or* by subject-raising to SpecTP (cf. Alexiadou and Anagnostopoulou, 1998). Violated otherwise.

Alexiadou and Anagnostopoulou (1998) argue that the parametric-seeming difference between Germanic languages on the one hand and Romance languages on the other is due to the fact that abstract subject-verb agreement relies either on subject-raising, in verbal-morphologically impoverished languages, or on verb-raising, in morphologically rich languages. For the implementation of a subject-movement constraint in OT, this is a natural position to adopt. Often in OT syntax null subjects (and null arguments generally) are not represented by *pro* but are instead completely absent, and reflected in the agreement morphology on the verb. Alexiadou and Anagnostopoulou's arguments about an EPP feature being 'multiply checkable' coincide neatly with this interpretation.

Even more generally, I include a constraint that has been consistently adopted in the literature, regarding the requirement that projections have heads:

(93) Obligatory Heads: ObHd (Grimshaw, 1997)

a. *All projections have heads.*

b. Satisfied whenever a projection is headed by an overt constituent or a trace. Violated whenever a projection lacks a head.

ObHd is responsible both for general structural well-formedness and for inversion in various utterance types (cf. Grimshaw, 1997).

The second set of constraints are connected to the position of the *wh*-word or *wh*-phrase in the representation, OpSp and OpSc:

(94) Operator in Specifier: OpSp (Grimshaw, 1997)

a. *Syntactic operators are in specifier position.*

b. Satisfied whenever sentential operators (e.g., Q or Force) surface in a specifier position. Violated whenever sentential operators surface elsewhere (e.g., adjoined or in head position).

(95) Operator Scope: OpSc (Grimshaw, 1997)

a. *Syntactic operators are in their scope position.*

b. Satisfied whenever syntactic operators have scope over all required projections. Violated whenever operators fail to surface in a position which would give them the proper scope.

OpSc constrains the (surface) hierarchical position of the operator, in this case a *wh*-operator, such that it may have scope over the required elements of the representation (i.e., all components of the proposition, or at least their traces). This constraint is therefore violated when the *wh*-phrase remains in situ, as in Mandarin or Hindi, but is not violated by either English or Spanish *wh*-questions (except for echo questions, which have a different input structure and so would be evaluated differently anyhow). OpSp further constrains the position of the *wh*-operator, being satisfied when the operator is in a specifier position (as opposed to being adjoined to the representation). It has been argued (by Baković, 1998, among others) that at least some dialects of Spanish utilize adjunction for at least some of their *wh*-questions—these structures will violate OpSp.

A third set of constraints includes three that fall into the category of FAITHFULNESS, though I claim that they are of different types. The first kind of FAITHFULNESS constraint evaluates the goodness of the fit of an output candidate relative to the input—FILL identifies structure in an output candidate that is not directly derived from the structure of the input. In other words, some constituent that contributes nothing to the meaning of a proposition nevertheless is expressed in a candidate.

(96) Fill: FILL (Based on Legendre et al., 1995; Grimshaw, 1997, *et seq.*: FULL-INT)

a. *Structure corresponds to input representation.*

b. Satisfied whenever each input element maps to one of the elements of the candidate. Violated whenever a candidate has an element (e.g., a dummy verb or an expletive subject) that does not serve to realize a component of the input.

FILL is responsible for the *lack of* expletives in many languages, like Spanish, while those languages, like English, that do have expletives must rank FILL low so that those expletives may surface. This contrast meshes with the usual interpretation that expletives are a sort of 'last resort', used when more broadly satisfied constraints cannot be satisfied in some set of contexts.

Another two FAITHFULNESS constraints, both of which are violated by candidates which are *missing* aspects of the input in their representations, are also operative; these represent the second type of FAITHFULNESS:

(97) Parse Tense: PARSET (Based on Legendre et al., 2002, as in Chapter 2)

a. *The tense feature on the verb is parsed.*

b. Satisfied whenever finiteness is realized either via verb-raising or affix-lowering.

Violated otherwise.

(98) Parse Questions: ParseQ (Based on Ackema and Neeleman (1998), Q-Marking, Gutiérrez-Bravo (2013), ICC/Interrogative Clause Condition, and Legendre et al. (1995,9))

a. *A [+Q] feature is assigned to the constituent corresponding to the proposition, i.e., the [+Q] feature is checked on the head of the highest projection.*

b. Satisfied whenever the head of the highest projection in a question is filled with overt material (e.g., a raised T or V or a Q-marker). Violated whenever the head of the highest projection in a question is empty.

ParseT and ParseQ require that the features in the input be reflected in the output candidates: any non-finite utterance violates ParseT, and any utterance that does not have an overt reflection of the 'attracting' power of the [+Q] feature, i.e. does not have a Q-marker (as in Japanese) or a verbal element in the head position of the highest projection of the phrase, violates ParseQ. The reader might wonder why the Parse constraints fall into the class of Faithfulness constraints (i.e., why they are initially ranked at the bottom of the hierarchy). I assume that inputs do specify features like [+T]/[-T] and [+Q]/[-Q], and that it is a violation of input-output faithfulness not to have these, when present in the input, also reflected in the output structures. Alternatively, however, these so-called Faithfulness constraints might have been construed as Structure constraints, along the lines of ObHd or OpSp, given that they are effectively constraints on the *form* of optimal candidates. That is, *Gen* might have produced candidates with and without, e.g., [+T], and allow contrasts between finite and non-finite forms to be drawn via other constraints. I reject this option and classify the Parse constraints as Faithfulness ones—violated frequently by child productions—in line with previous work in child syntax and phonology.

A final set of constraints are Economy constraints. First, constraints relating to *economy of movement* restrict movement generally, and movement of lexical heads specifically:

(99) Stay: Stay (Grimshaw, 1997)

a. *Traces are absent.*

b. Satisfied whenever there is no movement. Violated whenever a trace is left (multiple traces = multiple violations).

(100) No Lexical Head Movement: *LxHdMv (Grimshaw, 1997)

a. *Lexical heads do not move.*

b. Satisfied whenever a lexical head remains in its base-generated position. Violated whenever a lexical head moves and leaves behind a trace.

Second, the same *economy of structure* constraints that were used in the previous chapter involving TP and the copula to restrict the amount of structure available to the speaker do so here as well; these constraints straightforwardly implement the gradual structure-building hypothesis that grounds the developmental account adopted throughout:

(101) *Functional Projections: *F (Legendre et al., 2004)

a. *Functional projections are absent.*

b. Satisfied whenever the structure does not project beyond VP. Violated when the structure contains a single functional projection (e.g., TP).

(102) *Two Functional Projections: *F^2 (Legendre et al., 2004)

a. *Pairs of functional projections are absent.*

b. Satisfied whenever the structure does not project beyond VP. Violated when the structure contains two functional projections (e.g., TP and CP).

In principle a limitless number of *F constraints could be proposed, each one the result of local conjunction of an additional single *F constraint (Smolensky, 2006).

These eleven constraints condition the possible forms of *wh*-questions in adult and child Spanish and English (and across the *wh*-typology as well), and so evaluating our candidate set against them will allow us to remove harmonically bounded candidates and to determine what the correct rankings are for these two languages—with respect to *wh*-questions, but also respecting other constructions whose optimal forms should also be selected by the same ranking of constraints argued for here.[8]

Recall that (a) represents the English target, (b) the Spanish target, and (c) and (d) two of the child error possibilities, including in Tableau 3.1.

There are several harmonically bounded candidates that are eliminated in virtue of the fact that their violation profiles represent a proper superset of the violation profile of another candidate, as in (103–105).

[8] A final, morphological constraint is also involved in *wh*-questions insofar as it is involved in any utterance that is conditioned by information structure. RdTop is one in a series of Markedness constraints working toward economy of representation; it is the constraint that is violated by a full DP representing an English argument that is already a discourse topic, or by a full DP *or* a pronoun in the same case but for Spanish.

(1) Reduce Topic: RdTop (Based on Samek-Lodovici, 1996, $\text{DropTopic}_{\text{REL}}$)

a. *Topics are reduced.*

b. Satisfied whenever a topic is reduced or omitted from the surface form. Violated whenever a topic is a full DP. (One of a Markedness hierarchy pertaining to topichood.)

Candidates violating this constraint are not considered below.

Object question	*F^2	*F	*LxHdMv	Stay	Fill	OpSc	OpSp	EPP	ObHd	ParseT	ParseQ
a. $[_{CP}$ what does $[_{TP}$ subj t_{aux} $[_{VP}$ t_{subj} see t_{wh}]]]	*	**		***	*						
b. $[_{TP}$ what sees $[_{VP}$ -- t_{verb} t_{wh}]]		*	*	**							
c. $[_{CP}$ what *e* $[_{TP}$ subj *e* $[_{VP}$ t_{subj} see t_{wh}]]]	*	**		**					**	*	*
d. $[_{TP}$ what *e* $[_{VP}$ subj see t_{wh}]]		*		*				*	*	*	*
e. $[_{TP}$ what $[_{TP}$ subj *e* $[_{VP}$ t_{subj} see t_{wh}]]]		*		**			*		*	*	*
f. $[_{CP}$ what does $[_{TP}$ *e* t_{aux} $[_{VP}$ subj see t_{wh}]]]	*	**		**	*			*			
g. $[_{CP}$ what *e* $[_{TP}$ *e* does $[_{VP}$ subj see t_{wh}]]]	*	**		*	*			*	*		*
h. $[_{TP}$ what does $[_{VP}$ subj see t_{wh}]]]		*		*	*			*			
i. $[_{TP}$ what $[_{TP}$ *e* does $[_{VP}$ subj see t_{wh}]]]		*		*	*		*	*			
j. $[_{TP}$ *e* does $[_{VP}$ subj see what]]]		*			*	*	*	*			
k. $[_{CP}$ what *e* $[_{TP}$ subj does $[_{VP}$ t_{subj} see t_{wh}]]]	*	**		**	*				*		*
l. $[_{CP}$ what sees $[_{TP}$ subj t_{verb} $[_{VP}$ t_{subj} t_{verb} t_{wh}]]]	*	**	*	****							
m. $[_{CP}$ what sees $[_{TP}$ *e* t_{verb} $[_{VP}$ subj t_{verb} t_{wh}]]]	*	**	*	***							
n. $[_{CP}$ what *e* $[_{TP}$ *e* sees $[_{VP}$ subj t_{verb} t_{wh}]]]		*	*	**					*		*
o. $[_{TP}$ what $[_{TP}$ *e* sees $[_{VP}$ subj t_{verb} t_{wh}]]]	*	**	*	**			*				
p. $[_{CP}$ what *e* $[_{TP}$ subj sees $[_{VP}$ t_{subj} t_{verb} t_{wh}]]]	*	**	*	***					*		*
q. $[_{CP}$ what *e* $[_{TP}$ *e* *e* $[_{VP}$ subj see t_{wh}]]]		**	*	*				*	**	*	*
r. $[_{VP}$ subj see what]						*	*	*		*	
s. $[_{TP}$ subj $[_{TP}$ what sees $[_{VP}$ t_{subj} t_{verb} t_{wh}]]]		*	*	***		*					
t. $[_{TP}$ what $[_{TP}$ subj sees $[_{VP}$ t_{subj} t_{verb} t_{wh}]]]		*	*	***			*				
u. $[_{VP}$ what $[_{VP}$ subj see t_{wh}]]				*			*	*		*	
v. $[_{TP}$ what $[_{TP}$ subj does $[_{VP}$ t_{subj} see t_{wh}]]]		*		**	*		*				

Table 3.1: Full constraint/candidate list (with violations), constraints ranked roughly in ‘default’ order (economy = high)

(103) Candidate (b) harmonically bounds candidates (l), (m), (n), (o), (p), (s), and (t): the harmonically bounded candidates here incur the same two STAY violations and the same *LXHDMV violation as (b), plus other violations.

(104) Candidate (d) harmonically bounds candidate (q): (q) is just (d) with empty movement.

(105) Candidate (h) harmonically bounds (f), (g), and (i): the FILLviolation that (h) incurs is compounded with OBHD, OPSP, and PARSEQ violations in these other candidates.

Importantly, candidate (b), the maximally economical structural alternative that we had been considering for Spanish (cf. Baković, 1998) harmonically bounds the full CP/English-like Spanish structure, which corresponds to (l), as well as the structure in which we raised the *wh*-word to SPECCP while leaving the verb in T^0, which corresponds to (n). Therefore we have removed the need to assess independently which type of structure we should adopt for Spanish given the input at hand and the target surface word order of argument *wh*-questions in Spanish: the alternative structural representations, (l) and (n) in Tableau 3.1, can *never* win in an optimization over these constraints and candidates. One could imagine formalizing into constraints the notions that led the linguists who proposed those representations—a constraint capturing the Wh-criterion, for instance—in which case (b) would be ruled out in virtue of its failure to map [+wh] and [+Q] uniquely into CP. But a virtue of OT is that rather general constraints conspire to produce nuanced results across a language, and recourse to a more specific constraint like one that reflects the Wh-criterion can and should be avoided in favor of these more subtle, and more typologically restrictive, constraint *interactions*.

Now removing the harmonically bounded candidates from the tableau, as in Tableau 3.2 allows us to see that there are really not so many candidates competing for optimality for this input.

Yet there are still more candidates and constraints in Tableau 3.2 than need be entertained. Every attested winner, both child and adult, satisfies OpSc: there is no *wh*-in-situ here (cf. Pozzan, 2011). Therefore OpSc, the constraint that penalizes an operator that does not have proper scope, does not appear to be violated by virtually any child productions in either English or Spanish, in the speech of either monolinguals or bilinguals, so it can be eliminated without concern that its absence masks likely optimal candidates. (This strategy amounts to claiming that OpSc ranks high in both child and adult grammars of Spanish and English, and comes to do so early.)

The act of removing the OpSc constraint would have undesirable consequences for the upcoming optimizations if we did not also remove from consideration the candidates that *would be* eliminated by it: (g) and (i). With OpSc outranking all of the other constraints discussed here, (g) and (i) will of course never win—so while they are not harmonically bounded, they do not stand a chance in any of the rankings that children entertain at this age. Indeed, just because *wh-in-situ* is not documented for English or Spanish monolingual children does not mean that they *had never* entertained such a ranking. It does mean, however, that by the time they are capable of *producing wh*-questions they already have OpSc's relatively high position in the hierarchy established.The outcome of removing OpSc *and* candidates (g) and (i) preserves all of the remaining candidates and does not introduce any

Object question	*F^2	*F	*LxHdMv	Stay	Fill	OpSc	OpSp	EPP	ObHd	ParseT	ParseQ
a. [$_{CP}$ what does [$_{TP}$ subj t_{aux} [$_{VP}$ t_{subj} see t_{wh}]]]	*	**		***	*						
b. [$_{TP}$ what sees [$_{VP}$ -- t_{verb} t_{wh}]]		*	*	**							
c. [$_{CP}$ what *e* [$_{TP}$ subj *e* [$_{VP}$ t_{subj} see t_{wh}]]]	*	**		**					**	*	*
d. [$_{TP}$ what *e* [$_{VP}$ subj see t_{wh}]]		*		*				*	*	*	*
e. [$_{TP}$ what [$_{TP}$ subj *e* [$_{VP}$ t_{subj} see t_{wh}]]]		*		**			*		*	*	*
f. [$_{TP}$ what does [$_{VP}$ subj see t_{wh}]]]		*		*	*			*			
g. [$_{TP}$ *e* does [$_{VP}$ subj see what]]]		*			*	*	*	*			
h. [$_{CP}$ what *e* [$_{TP}$ subj does [$_{VP}$ t_{subj} see t_{wh}]]]	*	**		**	*				*		*
i. [$_{VP}$ subj see what]						*	*	*		*	
j. [$_{VP}$ what [$_{VP}$ subj see t_{wh}]]				*			*	*		*	
k. [$_{TP}$ what [$_{TP}$ subj does [$_{VP}$ t_{subj} see t_{wh}]]]		*		**	*		*				

Table 3.2: Full constraint/candidate list (with violations), harmonically bounded candidates removed

new harmonically bounded candidates: there is still a ranking under which each of the candidates (a) through what is now (i) could win. The final set of candidates, to be evaluated in the remainder of this section, along with their violation profiles, is shown in Tableau 3.3.

Tableau 3.3 has another important characteristic, which is that even though no claim is being staked as to the strict relative ranking here (as indicated by the dashed lines), I have ranked the constraints in approximately the order in which we would expect them to be ranked in a young child's grammar, irrespective of the language(s) that she is acquiring.[9] This is because the ranking respects the mandate to initialize the child grammar with Markedness constraints above Faithfulness constraints. Smolensky (1996) argues that in order for the grammar of languages that lack certain marked structures to be acquired, Faithfulness constraints must be ranked below Markedness constraints early in the learning process. This is because highly ranked Faithfulness constraints, from the beginning of acquisition, would predict that children should produce utterances that are maximally similar to the primary linguistic data that they receive: their learning task would amount to memorizing surface forms, effectively imitating adult productions. In order to learn *a grammar*, the child must interleave Markedness constraints among Faithfulness ones.

3.3.2 English and Spanish (adult) target rankings

We can now finally return to the issue of determining the rankings for the adult English and Spanish *wh*-questions, and then move on to the monolingual child rankings. For reference,

[9]This is a slight oversimplfication. There are two pairs of constraints that are strictly ranked with respect to one another, given that they are members of Markedness hierarchies. *F and *F^2 are constraints against numbers of functional projections (i.e., *F^2 is shorthand for the local conjunction of two *F constraints, *F^3 of three *F constraints), and so any violation of *F^2 entails a violation of *F (cf. Legendre et al., 2004; Smolensky, 2006). *F^2 is therefore always ranked above *F. Similarly, *LxHdMv will always outrank Stay: a violation of the former entails (at least one) violation of the latter.

Object question	*F^2	*F	*LxHdMv	Stay	Fill	OpSp	EPP	ObHd	ParseT	ParseQ
a. [$_{CP}$ what does [$_{TP}$ subj t_{aux} [$_{VP}$ t_{subj} see t_{wh}]]]	*	**		***	*					
b. [$_{TP}$ what sees [$_{VP}$ -- t_{verb} t_{wh}]]		*	*	**						
c. [$_{CP}$ what *e* [$_{TP}$ subj *e* [$_{VP}$ t_{subj} see t_{wh}]]]	*	**		**				**	*	*
d. [$_{TP}$ what *e* [$_{VP}$ subj see t_{wh}]]		*		*			*	*	*	*
e. [$_{TP}$ what [$_{TP}$ subj *e* [$_{VP}$ t_{subj} see t_{wh}]]]		*		**		*		*	*	*
f. [$_{TP}$ what does [$_{VP}$ subj see t_{wh}]]]		*		*	*		*			
g. [$_{CP}$ what *e* [$_{TP}$ subj does [$_{VP}$ t_{subj} see t_{wh}]]]	*	**		**	*			*		*
h. [$_{VP}$ what [$_{VP}$ subj see t_{wh}]]				*		*	*		*	
i. [$_{TP}$ what [$_{TP}$ subj does [$_{VP}$ t_{subj} see t_{wh}]]]		*		**	*	*				

Table 3.3: **Final** constraint/candidate list (post-removal of 'universally' satisfied OpSc)

immediately below I reproduce the target representations that the discussion has converged on, alongside their violation profiles.

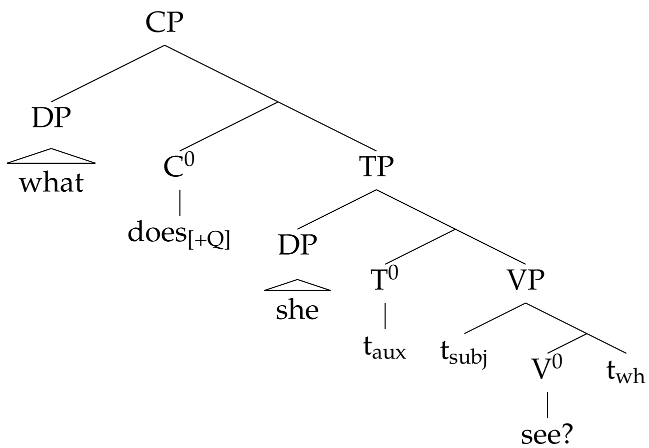


Figure 3.8: Argument *wh*-question: English underlying structure (reproduction of Figure 3.2)

Constraint	# of violations
*F^2	1
*F	2
Stay	3
Fill	1
OpSc	0
OpSp	0
ObHd	0
EPP	0
*LxHdMv	0
ParseT	0
ParseQ	0

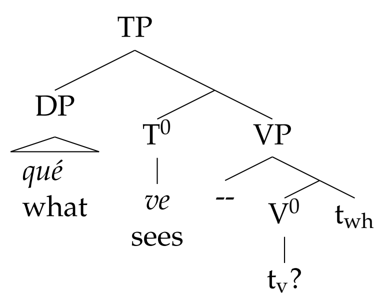


Figure 3.9: Argument *wh*-question: Spanish underlying structure (reproduction of Figure 3.6)

Constraint	# of violations
*F	1
Stay	2
*LxHdMv	1
*F^2	0
Fill	0
OpSc	0
OpSp	0
ObHd	0
EPP	0
ParseT	0
ParseQ	0

Evidently there is not much difference in the violation profiles of the English and Spanish target structures. Because each optimal candidate only violates three constraints of the set being considered (lumping *F and *F^2 together for the moment), for each language we can rank the constraints into two strata, i.e., into two blocks of constraints which, inside a block, are unranked, yielding partial rankings. This state of the grammar is akin to the floating constraints that captured optionality in monolingual English-acquiring children's optional use of BE in the previous chapter: constraints are not crucially ranked with respect to one another *yet*.[10]

In English, the strata are as in (106), with the full ranking shown in Figure 3.4.

(106) {*LxHdMv, OpSp, EPP, ObHd, ParseT} ≫ {*F, *F², Stay, Fill}

The adult English speaker has demoted Fill below structural constraints; this way, even though the winning candidate does violate Fill, it is still optimal.

In Spanish we see different strata emerge, as in (107), with the corresponding ranking shown in Figure 3.5; *LxHdMv is located in the lower stratum because it is systematically violated by the Spanish winner.

(107) {Fill, OpSp, EPP, ObHd, ParseT} ≫ {*F, *F², Stay, *LxHdMv}

In Spanish, both of the constraints that are found in the lower stratum are ones that penalize movement: *LxHdMv penalizes the movement of lexical heads, while *F and *F² penalize

[10] A choice was made to include more constraints, and more candidates, because entertaining fewer constraints might lead to the assertion that some of the outputs of *Gen* are harmonically bounded, when in fact they are not—and given that all of the constraints under discussion here have been independently motivated in the literature, this would be an unacceptable result. As the tableau in this footnote shows, candidates (b) and (f) are harmonically bounded when only 5 constraints are considered, but we know independently from entertaining more, required constraints that these candidates are real competitors and so would be wrongly ruled out by harmonic bounding.

Object question	EPP	ObHd	OpSp	Fill	*F²
☞ a. $[_{CP}$ what does $[_{TP}$ subj t_{aux} $[_{VP}$ t_{subj} see t_{wh}]]]				⊛	⊛
b. $[_{TP}$ what sees $[_{VP}$ -- t_{verb} t_{wh}]] *(ruled out by* *LxHdMv*)*	!!				
c. $[_{CP}$ what *e* $[_{TP}$ subj *e* $[_{VP}$ t_{subj} see t_{wh}]]]		*!*			*
d. $[_{TP}$ what *e* $[_{VP}$ subj see t_{wh}]]	*!	*			
e. $[_{TP}$ what $[_{TP}$ subj *e* $[_{VP}$ t_{subj} see t_{wh}]]]		*!	*		
f. $[_{TP}$ what does $[_{VP}$ subj see t_{wh}]]]	*!			*	
g. $[_{CP}$ what *e* $[_{TP}$ subj does $[_{VP}$ t_{subj} see t_{wh}]]]		*!		*	*
h. $[_{VP}$ what $[_{VP}$ subj see t_{wh}]]	*!		*		
i. $[_{TP}$ what $[_{TP}$ subj does $[_{VP}$ t_{subj} see t_{wh}]]]			*!	*	

Object question	*LxHdMv	OpSp	EPP	ObHd	ParseT	ParseQ	*F^2	*F	Stay	Fill
☞ a. $[_{CP}$ what does $[_{TP}$ subj t_{aux} $[_{VP}$ t_{subj} see $t_{wh}]]]$							⊛	⊛⊛	⊛⊛⊛	⊛
b. $[_{TP}$ what sees $[_{VP}$ -- t_{verb} $t_{wh}]]$	*!							*	**	
c. $[_{CP}$ what *e* $[_{TP}$ subj *e* $[_{VP}$ t_{subj} see $t_{wh}]]]$				*!*	*	*	*	**	**	
d. $[_{TP}$ what *e* $[_{VP}$ subj see $t_{wh}]]$			*!	*	*	*		*	*	
e. $[_{TP}$ what $[_{TP}$ subj *e* $[_{VP}$ t_{subj} see $t_{wh}]]]$		*!		*	*	*		*	**	
f. $[_{TP}$ what does $[_{VP}$ subj see $t_{wh}]]]$			*!					*	*	*
g. $[_{CP}$ what *e* $[_{TP}$ subj does $[_{VP}$ t_{subj} see $t_{wh}]]]$				*!		*	*	**	**	*
h. $[_{VP}$ what $[_{VP}$ subj see $t_{wh}]]$		*!	*		*				*	
i. $[_{TP}$ what $[_{TP}$ subj does $[_{VP}$ t_{subj} see $t_{wh}]]]$		*!						*	**	*

Table 3.4: English target ranking

Object question	Fill	OpSp	EPP	ObHd	ParseT	ParseQ	*F^2	*F	*LxHdMv	Stay
a. [$_{CP}$ what does [$_{TP}$ subj t$_{aux}$ [$_{VP}$ t$_{subj}$ see t$_{wh}$]]]	*!						*	**		***
☞ b. [$_{TP}$ what sees [$_{VP}$ -- t$_{verb}$ t$_{wh}$]]								⊛	⊛	⊛⊛
c. [$_{CP}$ what *e* [$_{TP}$ subj *e* [$_{VP}$ t$_{subj}$ see t$_{wh}$]]]				*!*	*	*	*	**		**
d. [$_{TP}$ what *e* [$_{VP}$ subj see t$_{wh}$]]			*!	*	*	*		*		*
e. [$_{TP}$ what [$_{TP}$ subj *e* [$_{VP}$ t$_{subj}$ see t$_{wh}$]]]		*!		*	*	*		*		**
f. [$_{TP}$ what does [$_{VP}$ subj see t$_{wh}$]]]	*!		*					*		*
g. [$_{CP}$ what *e* [$_{TP}$ subj does [$_{VP}$ t$_{subj}$ see t$_{wh}$]]]	*!			*		*	*	**		**
h. [$_{VP}$ what [$_{VP}$ subj see t$_{wh}$]]		*!	*		*					*
i. [$_{TP}$ what [$_{TP}$ subj does [$_{VP}$ t$_{subj}$ see t$_{wh}$]]]	*!	*						*		**

Table 3.5: Spanish target ranking

functional projections. This is an intuitive result, given the degree of freedom of movement, and particularly of fronting, that is found in Spanish (and other Romance languages that possess rich agreement).

Naturally *wh*-questions are not representative of the whole class of primary linguistic data from which speakers learn, and so the low degree of fixedness of this ranking is an artifact of our examining this construction only. Considering other utterances types would allow us to fix these rankings further; for English that task has already been completed by Jane Grimshaw (1997), and we could look to the traditionally 'parametric' differences, e.g. displaying movement of the lexical verb or not, between English and Spanish to identify what the target ranking of constraints is for Spanish as well. The rankings that I discuss throughout this section and in the remainder of the project are consistent with Grimshaw (1997), and in some cases can determine the relative ranking of two constraints that her own data could not inform (i.e., constraints that she did not claim were crucially ranked with respect to one another).

3.3.3 English child error rankings

By far the most common *wh*-question error produced by English-acquiring children is that of omission of the auxiliary (or of the copula). In the case of simple (i.e., not progressive) object *wh*-questions like the one that the input currently under discussion represents, the rates of auxiliary omission are even higher than the overall omission rates. The overall omission rates were displayed in Figure 3.1 in Section 3.2; the *do*-/modal-related error rates are reproduced here as Figure 3.10.[11]

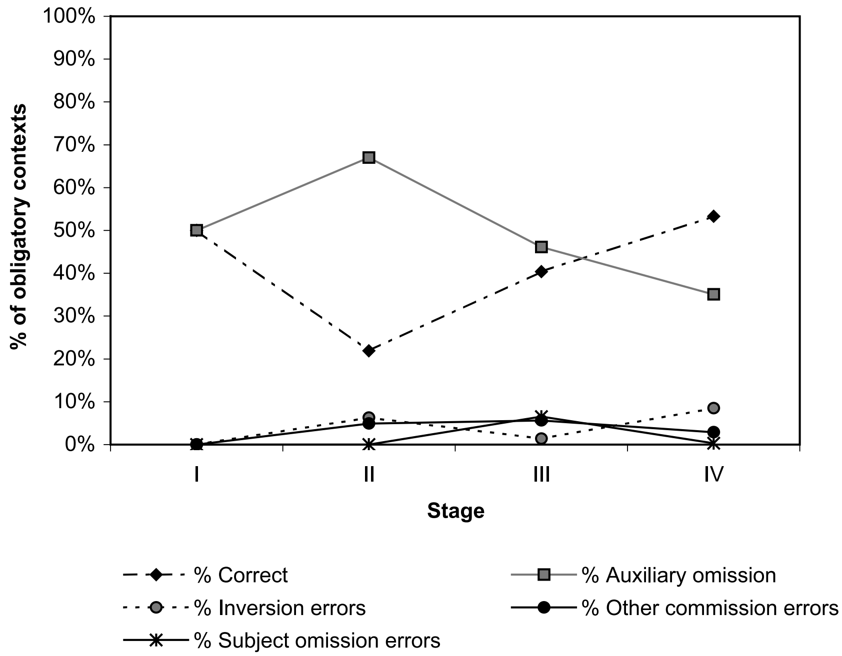


Figure 3.10: *Do*/modal error rates documented in the Manchester corpus by Rowland et al. (2005, Figure 5, used with permission from ASHA)

Rowland et al. (2005) argue that the U-shaped curve evident in the data is the result of rote-learned forms appearing at the first stage, to be gradually replaced by rule-application (which is more prone to error in early productions than rote reproductions would be). This may be so, or it may be the case that, as constraints are gradually demoted, different structures corresponding to the same surface forms emerge—along the lines of

[11] *Do* and modals need to be grouped together because when they are omitted it is impossible to tell which auxiliary was intended—omission of either results in a bare form:

(1) a. what [0can] Siri understand?
    b. what [0does] Siri understand?

There are not many uses of modal auxiliaries in the speech of such young children in any case, which I confirmed by searching for each one in all of the files of the Manchester corpus. Nevertheless, it should be noted that the absence of overt modals may bear on the claim defended by Hyams (2007); Hoekstra and Hyams (1998) that in some languages non-finite root forms, of the sort discussed in the previous chapter, reliably have modal interpretations (yet not in Spanish or in English).

the developmental account of Davidson and Legendre (2003). But before accounting for the *progression* of developmental stages, let us look at the rankings that allow the erroneous child winners to surface. In these analyses (as above, though there it went unremarked), I abstract away from issues of morphological subject case because the data overall are too sparse to address them.[12] But with so many constraints and candidates already involved, it is best to look at candidates that do not commit to having nominative case on the subject (which, the reader will recall, may be null in target Spanish questions at any rate).

This means that we can effectively represent the child error from (89a) as the simple (108).

(108) what [*does] subj see?

Of course the difference between this structure and the target structure can be straightforwardly captured, the crucial ranking being that of Fill relative to a structural constraint like ObHd or to a Faithfulness constraint like ParseT:

Object question input	ObHd	Fill
☞ a. what does subj see		⊛
b. what [*does] subj see	*!	

Table 3.6: Crucial ranking, *do* omitted, ObHd decisive

[12]It might be possible to model a single child's *wh*-question development progression incorporating this factor, but overall in the (monolingual) Manchester corpus, clearly much larger than the FerFuLice or Deuchar (bilingual) corpora, there are only 4 clear tokens of subjects with oblique case in *wh*-questions with a *do* auxiliary, suggesting that this is not an important pattern.

Object question input	ParseT	Fill
☞ a. what does subj see		⊛
b. what [*does] subj see	*!	

Table 3.7: Crucial rankings, *do* omitted, ObHd and ParseT decisive

But what the minimal rankings in Tableaux 3.6 and 3.7 do not address is the several possible abstract representations—the grammatical *causes*—of the omission of dummy *do*. Of the candidate abstract structural representations that remain after the harmonic bounding procedure was complete (Tableau 3.3), several representations correspond to this surface form:

(109) (c) [$_{CP}$ what *e* [$_{TP}$ subj *e* [$_{VP}$ t_{subj} see t_{wh}]]]

(d) [$_{TP}$ what *e* [$_{VP}$ subj see t_{wh}]]

(e) [$_{TP}$ what [$_{TP}$ subj *e* [$_{VP}$ t_{subj} see t_{wh}]]]

(h) [$_{VP}$ what [$_{VP}$ subj see t_{wh}]]

The remaining candidates that were not removed for being harmonically bounded contain non-inverted 'does':

(110) (g) [$_{CP}$ what *e* [$_{TP}$ subj does [$_{VP}$ t_{subj} see t_{wh}]]]

(i) [$_{TP}$ what [$_{TP}$ subj does [$_{VP}$ t_{subj} see t_{wh}]]]

And a final remaining candidate, (f) [$_{TP}$ what does [$_{VP}$ subj see t_{wh}]]], displays the target surface order but fails to satisfy EPP, which in the English target ranking appears to be undominated.

After walking through the constraints that affect *wh*-question production and the many candidates that *Gen* produces for a simple argument *wh*-question input, we have finally laid enough groundwork to address the developmental differences between Spanish and English monolingual children. It is clear that in the target rankings for both languages the *F constraints and the Parse constraints must reside in the lower stratum, and for the moment I set aside the differences between the two languages and address the interesting *empirical* patterns found in English monolingual child productions: auxiliary omissions and non-inversion of the auxiliary. What I show in the upcoming sections is that there are multiple possibilities for the candidates and constraints that I have developed to generate the English child error forms. I therefore consider rankings for each of the candidates whose surface structures match the attested child productions, and motivated by theoretical and empirical concerns choose from among these in the end.

Auxiliary omission error rankings Since there is no way on the surface to distinguish among the candidates in (109), I present in order of economy the rankings that select each one, i.e. from the most economical structure to the least economical one. This gives some order to the discussion of learning in what is otherwise a rather large list of candidates. Ultimately I will continue to consider (e) and (i) as the relevant child forms, but this is for reasons independent from the rankings that give rise to this whole collection of child options, as I discuss below.

In a possible ranking for (h), shown in Figure 3.8, we see two strata: the uppermost stratum simply contains the constraints on functional structure, *F and *F^2. This is the most economical structure possible for *wh*-questions such that each of the lexical items of the input are parsed.

Object question	*F²	*F	*LxHdMv	Stay	Fill	OpSp	EPP	ObHd	ParseT	ParseQ
a. [$_{CP}$ what does [$_{TP}$ subj t$_{aux}$ [$_{VP}$ t$_{subj}$ see t$_{wh}$]]]	!*	**		***	*					
b. [$_{TP}$ what sees [$_{VP}$ -- t$_{verb}$ t$_{wh}$]]		*!	*	**						
c. [$_{CP}$ what *e* [$_{TP}$ subj *e* [$_{VP}$ t$_{subj}$ see t$_{wh}$]]]	*!	**		**				**	*	*
d. [$_{TP}$ what *e* [$_{VP}$ subj see t$_{wh}$]]		*!		*			*	*	*	*
e. [$_{TP}$ what [$_{TP}$ subj *e* [$_{VP}$ t$_{subj}$ see t$_{wh}$]]]		*!		**		*		*	*	*
f. [$_{TP}$ what does [$_{VP}$ subj see t$_{wh}$]]]		*!		*	*		*			
g. [$_{CP}$ what *e* [$_{TP}$ subj does [$_{VP}$ t$_{subj}$ see t$_{wh}$]]]	*!	**		**	*			*		*
☞ h. [$_{VP}$ what [$_{VP}$ subj see t$_{wh}$]]				⊛		⊛	⊛		⊛	
i. [$_{TP}$ what [$_{TP}$ subj does [$_{VP}$ t$_{subj}$ see t$_{wh}$]]]		*!		**	*	*				

Table 3.8: Optimization reflecting the English auxiliary omission pattern, with maximally economical winner

Candidate (d) is minimally different from (h), in that it projects another level of (functional) structure, TP, as opposed to merely adjoining the *wh*-word to the VP. Its ranking, shown in Figure 3.9, involves the ranking of *F below *LxHdMv (which was not crucial in the ranking for (h)) and also below OpSp—it is advantageous to this candidate that the *wh*-operator is in the TP specifier.

	Object question	*F^2	*LxHdMv	OpSp	Fill	*F	Stay	EPP	ObHd	ParseT	ParseQ
	a. [$_{CP}$ what does [$_{TP}$ subj t_{aux} [$_{VP}$ t_{subj} see t_{wh}]]]	*!			*	**	***				
	b. [$_{TP}$ what sees [$_{VP}$ -- t_{verb} t_{wh}]]		*!			*	**				
	c. [$_{CP}$ what *e* [$_{TP}$ subj *e* [$_{VP}$ t_{subj} see t_{wh}]]]	*!				**	**		**	*	*
☞	d. [$_{TP}$ what *e* [$_{VP}$ subj see t_{wh}]]					⊛	⊛	⊛	⊛	⊛	⊛
	e. [$_{TP}$ what [$_{TP}$ subj *e* [$_{VP}$ t_{subj} see t_{wh}]]]			*!		*	**		*	*	*
	f. [$_{TP}$ what does [$_{VP}$ subj see t_{wh}]]]				*!	*	*	*			
	g. [$_{CP}$ what *e* [$_{TP}$ subj does [$_{VP}$ t_{subj} see t_{wh}]]]	*!			*	**	**		*		*
	h. [$_{VP}$ what [$_{VP}$ subj see t_{wh}]]			*!			*	*		*	
	i. [$_{TP}$ what [$_{TP}$ subj does [$_{VP}$ t_{subj} see t_{wh}]]]			*!	*	*	**				

Table 3.9: Optimization reflecting the English auxiliary omission pattern, with OpSp satisfied and TP projected

Deriving the ranking for (e) involves another violation/satisfaction tradeoff, this time in comparison with the (d) ranking. In Tableau 3.10, EPP is in the upper stratum, while OpSp is in the lower: the subject raised to SpecTP, satisfying EPP, but that means that a specifier position is no longer available to house the *wh*-operator (without projecting another functional layer, which would have incurred a *F^2 violation), so a violation of OpSp is incurred.

Object question	*F^2	*LxHdMv	EPP	Fill	*F	OpSp	Stay	ObHd	ParseT	ParseQ
a. [$_{CP}$ what does [$_{TP}$ subj t_{aux} [$_{VP}$ t_{subj} see t_{wh}]]]	*!			*	**		***			
b. [$_{TP}$ what sees [$_{VP}$ -- t_{verb} t_{wh}]]		*!			*		**			
c. [$_{CP}$ what *e* [$_{TP}$ subj *e* [$_{VP}$ t_{subj} see t_{wh}]]]	*!				**		**	**	*	*
d. [$_{TP}$ what *e* [$_{VP}$ subj see t_{wh}]]			*!		*		*	*	*	*
☞ e. [$_{TP}$ what [$_{TP}$ subj *e* [$_{VP}$ t_{subj} see t_{wh}]]]					⊛	⊛	⊛⊛	⊛	⊛	⊛
f. [$_{TP}$ what does [$_{VP}$ subj see t_{wh}]]]			*!	*	*		*			
g. [$_{CP}$ what *e* [$_{TP}$ subj does [$_{VP}$ t_{subj} see t_{wh}]]]	*!			*	**		**	*		*
h. [$_{VP}$ what [$_{VP}$ subj see t_{wh}]]			*!			*	*		*	
i. [$_{TP}$ what [$_{TP}$ subj does [$_{VP}$ t_{subj} see t_{wh}]]]				*!	*	*	**			

Table 3.10: Optimization reflecting the English auxiliary omission pattern, satisfying EPP
(

Finally, the (c) child error candidate has the same number of functional projections as the adult target, (a), but because it does not have *do* inserted, it incurs violations of ObHd, ParseT, and ParseQ (while not violating Fill). However, as Tableau 3.11 demonstrates, with this candidate *F *and* *F^2 have arrived in the lower stratum, as they must be in the adult grammar.

Object question	*LxHdMv	OpSp	EPP	Fill	Stay	*F^2	*F	ObHd	ParseT	ParseQ
a. [$_{CP}$ what does [$_{TP}$ subj t_{aux} [$_{VP}$ t_{subj} see t_{wh}]]]				*!	***	*	**			
b. [$_{TP}$ what sees [$_{VP}$ -- t_{verb} t_{wh}]]	*!				**		*			
☞ c. [$_{CP}$ what *e* [$_{TP}$ subj *e* [$_{VP}$ t_{subj} see t_{wh}]]]					⊛⊛	⊛	⊛⊛	⊛⊛	⊛	⊛
d. [$_{TP}$ what *e* [$_{VP}$ subj see t_{wh}]]			*!		*		*	*	*	*
e. [$_{TP}$ what [$_{TP}$ subj *e* [$_{VP}$ t_{subj} see t_{wh}]]]		*!			**		*	*	*	*
f. [$_{TP}$ what does [$_{VP}$ subj see t_{wh}]]]			*!	*	*		*			
g. [$_{CP}$ what *e* [$_{TP}$ subj does [$_{VP}$ t_{subj} see t_{wh}]]]				*!	**	*	**	*		*
h. [$_{VP}$ what [$_{VP}$ subj see t_{wh}]]		*!	*		*				*	
i. [$_{TP}$ what [$_{TP}$ subj does [$_{VP}$ t_{subj} see t_{wh}]]]		*!		*	**		*			

Table 3.11: Optimization reflecting the English auxiliary omission pattern, failing to parse tense

In principle, then, there are several rankings under which a child's grammar could select a candidate that omitted the auxiliary as optimal. Theory-internal evidence so far has not been able to dictate which of the rankings is likelier entertained around age 3, but as we will see in the next section, some considerations about partial rankings—of just the floating sort that were involved in copula omissions in the previous chapter—may serve to rule out at least a subset of these options. After the next section the optionality in monolingual development, we will return at last to the issue of *bilingual wh*-question development.

Optionality and development

What we have just seen is that for the four candidates that are possible hierarchical representations of the null-auxiliary English *wh*-question, there is a progression of rankings which the child might entertain before arriving at the target. It is possible that a given child entertains only one or two of these rankings in the course of her *wh*-question development, or that she entertains all four of them; *direct* evidence to bear on this is plainly unavailable.[13] But the knowledge that we do have about monolingual English development of *wh*-questions demonstrates that there is *optionality* of target *wh*-questions that needs to be captured using these representations—that is, optionality of *surface* forms, pertaining to auxiliary omission and failure to invert (as opposed to the several *structural* options that may *underlie* auxiliary omissions). In order for the target form to surface, Stay, Fill, and the constraints against functional projections must be ranked below all of the other constraints.

[13]It is not out of the question that a child would entertain this many or still more rankings at once; recall that it is simply a *lack* of settled constraint rankings that gives rise to multiple simultaneous options. This possibility has been explored for French (Legendre et al., 2002), Catalan (Davidson and Legendre, 2003), Mandarin Chinese (Legendre et al., 2004), and even in the copula analyses of the previous chapter, providing typologically varied evidence for the existence of partial rankings generally in children.

Questions with *do* are acquired by monolingual children at a gradual rate, as shown in Figure 3.10. The omission rates pass from 50% in Stage I, to approximately 60% in Stage II, followed by about 45% in Stage III and finally about 25% in Stage IV. Additionally, in Stage II and Stage IV, non-inversion errors, represented by candidates (g) and (i), approach 10%. Translated into Optimality-Theoretic terms, if we wish to capture the developmental progression by means of floating constraints (as with BE in Ch. 2), the crucial constraints must float around others such that more often than not the child form surfaces—but that the adult form may surface as well.

If we select the (g) structure—$[_{CP}$ what *e* $[_{TP}$ subj does $[_{VP}$ t_{subj} see $t_{wh}]]]$—the constraints crucial to capturing the inversion/non-inversion alternation are STAY and OBHD: so long as it is assumed that OPSP outranks STAY, then this result will hold. Swapping out OBHD for PARSEQ would supply the same result, since PARSEQ is violated when a head is empty as well—it simply refers to a *particular* head position, namely the head of the highest projection.[14] Therefore, we can posit for the inversion/non-inversion contrast the following two (partial) rankings, both of which primarily represent Stages II and IV:

(111) *Floating constraints: inversion/non-inversion, (a) vs. (g) contrast*

Fixed: OPSP $\gg$ STAY

Floating: OBHD ____________

(112) a. OPSP $\gg$ OBHD $\gg$ STAY yields: (a) $[_{CP}$ what does $[_{TP}$ subj t_{aux} $[_{VP}$ t_{subj} see $t_{wh}]]]$

b. OPSP $\gg$ STAY $\gg$ OBHD yields: (g) $[_{CP}$ what *e* $[_{TP}$ subj does $[_{VP}$ t_{subj} see $t_{wh}]]]$

The other structure that reflects the non-inverted order is (i)—$[_{TP}$ what $[_{TP}$ subj

[14]This should be so both with *do* and with other auxiliaries; FILL does not play a crucial role in this distinction, so the account is predicted to generalize to *wh*-questions with no material in the winning (or competitor) candidate that is not derived from a particular feature of the input.

does [$_{VP}$ t_{subj} see t_{wh}]]]. This candidate does not incur the ObHd violation that (g) does, but it fails to house the *wh*-operator in specifier position, indicating that OpSp has a role to play in the partial ranking from which that candidate could emerge as the winner. The advantage that (i) has over the target form (a), however, is that it only projects one level of functional structure: the *wh*-word is adjoined via TP recursion, meaning that a CP is absent, and the candidate does not violate $*F^2$. Here, we already know that *F and $*F^2$ are crucially ranked with respect to one another, and allowing OpSp to float around $*F^2$ again yields the sought optionality.

(113) *Floating constraints: inversion/non-inversion, (a) vs. (i) contrast*

Fixed: $*F^2 \gg *F$

Floating: OpSp ________

(114) a. OpSp $\gg *F^2 \gg *F$ yields: (a) [$_{CP}$ what does [$_{TP}$ subj t_{aux} [$_{VP}$ t_{subj} see t_{wh}]]]

b. $*F^2 \gg$ OpSp $\gg *F$ yields: (i) [$_{TP}$ what [$_{TP}$ subj does [$_{VP}$ t_{subj} see t_{wh}]]]

With only the *wh*-question data at hand, it would be difficult to choose between the alternatives that (111) and (113) represent; adding data from *yes/no* questions would not improve the situation either, given that the position of the non-inverted auxiliary is the same for (g) and (i).[15] But theory-internal evidence, at least, points toward (113) being the likelier accurate partial ranking. Theory-internal concerns suggest that a good deal of the distinction between child and adult productions is due to adults' ability to represent larger structures than children can—that is, the gradual structure-building hypothesis predicts child-adult production divergences based on children's limited structural representations.

[15]The same is true of the partial rankings that capture auxiliary omission.

(113) embodies this proposal, in that OpSp either dominates or is dominated by *F^2, resulting either in a smaller structure, violating the OpSp constraint, or in a larger structure that satisfies that constraint,[16] and is in line with both the proposal developed in the previous chapter for the copula and in other work that has addressed the development of multiple layers of structure (e.g., Legendre et al., 2002).

Having captured the inversion/non-inversion contrast in two different ways and settling on the variant that implements the gradual structure-building hypothesis, we turn now to the omission/inclusion of *do*. While there are four candidates that represent the surface structure containing *do* omissions, I will not consider (h) here—[$_{VP}$ what [$_{VP}$ subj see t$_{wh}$]]—because it violates (single-star) *F and is arguably unlikely to be produced in the same developmental stage as a structure that contains a full CP projection.

This still leaves us with several candidates from which to choose as representative of monolingual English child omissions. Candidates (c) and (e) can both coexist with the target candidate (a), while (f) and (d) can coexist—so I turn now to capturing their surfacing at the same developmental point as (a). I also assume that at a given point a child only entertains one of (c), (d), or (e) concurrently with a target structure (or, in the case of (f), with a pseudo-target structure) so as to streamline the analysis, but in principle this assumption is not needed. Adopting this assumption, however, invites the claim that Stages I and II are reflected in the (f) vs. (d) contrast, while Stages III and IV are reflected in the (a)

[16] It is unclear what empirical contrasts could distinguish (111) from (113), given the definitions of constraints that I have adopted. If I had defined ParseQ precisely as Ackema and Neeleman (1998) do, considering it satisfied either when the head *or the specifier* of the highest functional projection in a question structure is filled by something that can check a [+Q] feature, then (111) would be ruled out. This is because (111) predicts that inversion would be acquired for yes/no questions in English before it was acquired for *wh*-questions (cf. Atkinson, 2011). Such a prediction is not borne out by child corpora (cf. Rowland and Pine, 2000), but that fact does not inform my analyses anyway, given that my ParseQ constraint is not violated by the same candidates as Ackema and Neeleman's is. As it stands, the theoretical evidence will have to suffice on this point.

vs. (c) contrast: once monolingual children begin on a trajectory of *improvement* of the frequency of target-like *wh*-question productions, it is likely the case that they use target-like representations there as well.

Candidate (c) has the same level of structure projected as candidate (a), but it fails to parse Tense and to have any headed functional projections. Yet by incurring PARSET/PARSEQ/OBHD violations, (c) manages to avoid violating STAY three times (which (a) does) and FILL (which (a) does). Therefore, deriving (a) and (c) simultaneously is a matter of floating the FAITHFULNESS constraint FILL around the MARKEDNESS constraint OBHD, as in (115). Note that this partial list of constraints assumes that *F and *F^2 have been demoted below STAY and the other constraints in question.

(115) *Floating constraints:* do *omission, (a) vs. (c) contrast*

Fixed: EPP ≫ OBHD ≫ STAY

Floating: FILL ______________

(116) a. EPP ≫ OBHD ≫ FILL ≫ STAY yields: (a) [$_{CP}$ what does [$_{TP}$ subj t_{aux} [$_{VP}$ t_{subj} see t_{wh}]]]

b. EPP ≫ FILL ≫ OBHD ≫ STAY yields: (c) [$_{CP}$ what *e* [$_{TP}$ subj *e* [$_{VP}$ t_{subj} see t_{wh}]]]

Candidate (d) differs crucially from (c) in that it only projects structure through TP, meaning that it does not violate *F^2. It does, however, still violate OBHD (and the other constraints that tend to be violated along with it in this analysis, namely PARSET and PARSEQ). It additionally violates EPP, given that the *wh*-word occupies SPECTP and so the subject cannot. Interestingly, however, (d) forms a minimal pair with (f); the very mixed results on the acquisition of subject case in English suggest that there may not be straightforward syntactic bases to the case morphology apparent on pronominal English subjects. In this event it would not be unreasonable to assume that (f) is the form underlying target-like *wh*-questions in English monolingual acquisition, which could alternate with (d).

(117) *Floating constraints:* do *omission, (f) vs. (d) contrast*

Fixed: STAY ≫ OBHD ≫ EPP

Floating: FILL ________

(118) a. STAY ≫ OBHD ≫ FILL ≫ EPP yields: (f) [$_{TP}$ what does [$_{VP}$ subj see t_{wh}]]]

b. STAY ≫ FILL ≫ OBHD ≫ EPP yields: (d) [$_{TP}$ what *e* [$_{VP}$ subj see t_{wh}]]

Candidate (e) and candidate (a) may alternate in the following manner. The tradeoff between (a) and (e) involves the projection of more structure (candidate (a), violating $*F^2$) and the absence of a head (candidate (e), violating OBHD, PARSET, and PARSEQ). Any one of these constraints compelling an overt head (or a trace) might float around $*F^2$, permitting the smaller (but empty-headed) structure to emerge when $*F^2$ outranks OBHD; when OBHD outranks $*F^2$, then it is the larger structure with the obligatory head that wins out.

(119) *Floating constraints:* do *omission, (a) vs. (e) contrast*

Fixed: $*F^2$ ≫ $*F$

Floating: OBHD ________

(120) a. OBHD ≫ $*F^2$ ≫ $*F$ yields: (a) [$_{CP}$ what does [$_{TP}$ subj t_{aux} [$_{VP}$ t_{subj} see t_{wh}]]]

b. $*F^2$≫ OBHD ≫ $*F$ yields: (e) [$_{TP}$ what [$_{TP}$ subj *e* [$_{VP}$ t_{subj} see t_{wh}]]]

More constraints than just OBHD are violated by (e), though, as just mentioned. The violations of PARSET and PARSEQ would have to go unregistered, i.e., would have to take place low in the ranking. This is fine for purposes of acquisition, given that they are FAITHFULNESS constraints, and so are expected to start low.

As for deciding among these options as representative of what is really going on in the child's mind, it is likely that for this input the child *starts* with partial ranking represented by (117) and, as Stay is demoted through the ranking, passes to (115). Notice that these two partial rankings are in a sense 'inverses' of one another, with Stay on one end and EPP on the other. This makes sense intuitively, given that Stay incurs multiple violations by the target (adult) structure, including when EPP is satisfied. Ultimately ObHd and EPP, not crucially ranked with relative to one another, will outrank Stay. The alternative, (119), is more problematic because in order to *meaningfully* reveal the effects of floating around $*F^2$, the other constraints that are violated or satisfied along with ObHd, like ParseT, would have to float along with it. Multiple-constraint floating introduces what seems like an unnecessary degree of complexity here, but perhaps it could be warranted if numerically such floating led to predictions of the proportions of error-vs.-correct productions documented in the monolinguals' speech. Otherwise, empirical data confirming or contradicting any of these partial rankings appear to be absent.

We have now seen how the optionality present in English monolingual children's *wh*-questions can be captured in Optimality-Theoretic terms, potentially in multiple ways, and for each type of optionality (auxiliary omission and failure to invert) we have derived partial rankings that embody the gradual structure-building developmental hypothesis. (119) and (113) float different Markedness constraints around constraints of structural economy, giving rise to the patterns attested in English monolingual development. For Spanish children, on the other hand, target *wh*-questions are the only form produced. And because the winning Spanish structure is maximally economical (in that it uses structure only through TP) and is not exceptional with respect to the rest of the language (in that it violates only constraints for which there is otherwise ample evidence of low ranking, like *LxHdMv), there is no reason to posit that underlying those target productions is any optionality of structure.

3.4 Acquisition in simultaneous bilinguals

After reviewing the corpora and coding techniques used for this section, I finally present first the quantitative and then the formal/interpretative results, revealing that it is *facilitation* in spontaneous productions that arises during the simultaneous acquisition of Spanish and English.

3.4.1 Corpora and coding

The same corpora that were used in the previous chapter—the FerFuLice corpus and the Deuchar corpus—are used here as well. In coding these corpora, all child matrix argument and adjunct *wh*-questions were extracted from the corpora, including the three preceding lines, to provide context for the target questions. Questions that were unclear, were routines (such as singing a song), or immediate repetitions of self or another were excluded from the analysis, as were subject-*wh*-questions (see fn. 3), which would not be informative to the issues at hand. Contracted auxiliaries were included and were not classified as being different from their full forms. Errors of omission (70a, 70b), errors relating to inversion (70c), errors of double-marking (70d), and other errors of omission were all counted. All available files from the Deuchar and FerFuLice corpora were coded in this way, yielding 283 *wh*-questions in total.

3.4.2 Results

Overall, the Spanish-English bilingual children produce strikingly fewer errors in English than comparable monolinguals, as is plain from Figure 3.11 (compare with Figure 3.1 above).

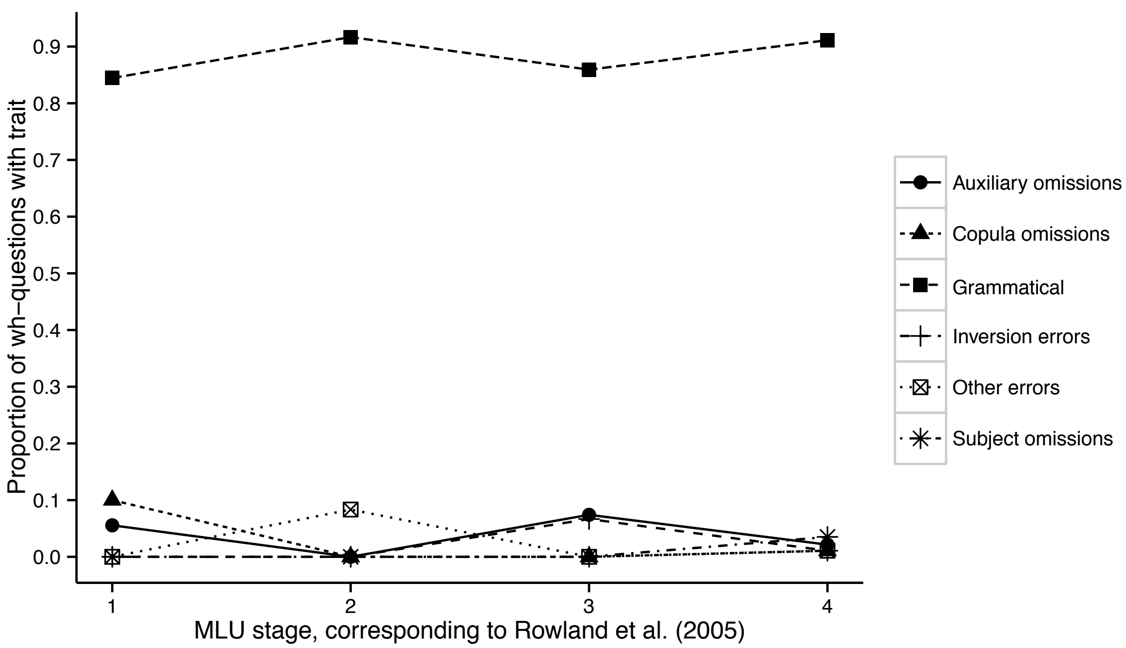


Figure 3.11: Mean rates of *wh*-question productions by Spanish-English bilinguals

No mean error rate surpasses 10%, in contrast to the auxiliary omission rates attested in the monolingual corpora, which at Stage II reached 50%. On the other hand, the bilingual corpora seem to have a higher incidence of other errors than the monolingual ones: for bilinguals, Stage I displays a 10% copula omission rate and Stage II an 8.3% 'other' error rate. The number of tokens per stage is too small to perform a statistical analysis that could determine whether these 'other' error rates are significantly different between the two groups, but since I am not out to capture precise *frequencies* of erroneous productions with this analysis I will leave that comparison for future research, when denser corpora might be obtained.

What is clear here is that the tendency to omit auxiliaries/copulas in *wh*-questions is far more restricted in the spontaneous English speech of Spanish-English bilinguals than it is in English monolinguals at the same stage of development based on MLU, as the examples in (121) attest.

(121) Sample target *wh*-question productions from Spanish-English bilinguals

a. where does it go? (Leo, FerFuLice, 24h_01—MLU 1.89)

b. what's gone away? (Simón, FerFuLice, 24i_01—MLU 2.66)

c. who is that? (Manuela, Deuchar, 871126eg—MLU 3.76)

Indeed, while of the 17 total auxiliary omissions in the bilingual data only 3 are not omissions of *do*, the pattern is evidently one of overall facilitation.

Summary

We have seen that the spontaneous production of English *wh*-questions by Spanish-English bilingual children reaches adult-like mastery earlier than it does in English monolingual children. The contrast between early bilingual and monolingual production of *wh*-questions in the corpus data can be explained using the same formalism that was employed in the previous chapter, representing the regularities of Spanish and of English in a single grammar—one in which the constraint ranking that is achieved on the basis of Spanish positively influences the evaluation of English inputs.

3.5 Facilitation in bilingual *wh*-questions: the OT analysis

I now show how acquiring Spanish and English simultaneously leads to earlier mastery of English *wh*-questions than acquiring English alone does, introducing a splitting-and-tagging mechanism *for the constraints*, which will allow the syntactic differences between Spanish and English to coexist in the single integrated grammar.

To remind the reader, the contrasts in constraint stratification between the English target ranking (106), the Spanish target ranking (107) are reproduced here.[17]

(106) English target strata

{*LxHdMv, OpSp, EPP, ObHd, ParseT} $\gg$ {*F^2, *F, Stay, *LxHdMv}

(107) Spanish target strata

{Fill, OpSp, EPP, ObHd, ParseT} $\gg$ {*F, *F^2, Stay, *LxHdMv}

I also reproduce the partial rankings that capture the optionality of target-like productions in English monolingual children, as a point of reference for what bilingual children do not experience—the non-inversion ranking in (114) and the auxiliary-omission ranking in (118):

(114) Monolingual English child non-inversion error

a. OpSp $\gg$ *F^2 $\gg$ *F yields: (a) [$_{CP}$ what does [$_{TP}$ subj t$_{aux}$ [$_{VP}$ t$_{subj}$ see t$_{wh}$]]]

b. *F^2 $\gg$ OpSp $\gg$ *F yields: (i) [$_{TP}$ what [$_{TP}$ subj does [$_{VP}$ t$_{subj}$ see t$_{wh}$]]]

[17] Simplified, that is, from the full list of constraints, which were all considered in the development of these partial rankings.

(120) Monolingual English child auxiliary omission error

a. ObHd ≫ $*F^2$ ≫ *F yields: (a) $[_{CP}$ what does $[_{TP}$ subj t_{aux} $[_{VP}$ t_{subj} see $t_{wh}]]]$

b. $*F^2$≫ ObHd ≫ *F yields: (e) $[_{TP}$ what $[_{TP}$ subj *e* $[_{VP}$ t_{subj} see $t_{wh}]]]$

The effect of having a shared grammar, and of acquiring Spanish alongside English, is to select between the rankings in (114), and (120) in such a way that the English target is acquired in virtue of a reranking on the basis of *Spanish* requirements.

Spanish supplies abundant motivation for ranking Stay beneath several constraints, which is in turn essential to the correct English *wh*-question optimization. In particular, Stay is violated at least once in *every* Spanish matrix clause, because the finite verb always raises out of V^0 and (at least) into T^0:

(122) 'we run' (null subject)

a. $[_{TP}$ corremos$_v$ $[_{VP}$ $t_v]]$

b. $*[_{TP}$ $[_{VP}$ corre$]]$

This requirement leads Stay to be demoted beneath ParseT—without violating Stay, ParseT cannot be satisfied and a child is unable to produce utterances that correspond to her primary linguistic data.

In addition, overt subjects in Spanish are often preverbal, even though it is not ungrammatical to leave the subject in *in situ* in the specifier of VP. If the subject does raise out of SpecVP, a candidate incurs a second Stay violation:

(123) 'we run' (overt subject)

a. $[_{TP}$ nosotros$_{subj}$ corremos$_v$ $[_{VP}$ t_{subj} $t_v]]$

Finally, although Stay was not discussed in the previous chapter, its low ranking is crucial to the emergence of *aspectual* be: because of the Head Movement Constraint (Travis, 1984), even though the Spanish aspectual be *estar* is base-generated in AspP, it needs to raise to TP, leaving behind yet another trace. Because we have seen that Spanish-acquiring children have no problem including *estar* and having it reflect tense, it must be the case that that verb does reliably raise and leave its trace—hence Stay must be ranked below ParseAsp and, again, ParseT.

We have just seen that Spanish-acquiring children have at least three pieces of frequently-encountered evidence that Stay should not inhibit multiple movement operations, which in turn translates into their demoting that constraint below Faithfulness constraints like ParseT and ParseQ. Because bilingual children operate with an integrated grammar, they can bootstrap their English productions off of the knowledge—the ranking—developed on the basis of Spanish primary linguistic data.

One more constraint is particularly important to the emergence of the correct winner in English: $*F^2$. Candidates (a) and (i) compete and are distinguished on the basis of number of Stay violations, as well as a tradeoff between an OpSp violation, which the non-target (i) incurs, and a $*F^2$ violation, which the target (a) incurs. $*F^2$ must be ranked low in both English and Spanish (monolingual) target grammars, lest it penalize any information structure-related representations—lower, specifically, than OpSc and EPP, given the need for the *wh*-phrase to take scope over the whole clause and for the subject or verb to raise into TP. But English does not provide a lot of evidence for this ranking. Particularly given the possibility of rote-learned (or rote-experienced) *wh*-questions early on, there is little in English that would require projection of structure above TP, and so English-acquiring children may be slow to acquire this, as evidenced by the errors they produce.

Spanish is a different story. Children acquiring Spanish make use of constructions involving CP before age 3, as in (124), indicating that they have available positions that children acquiring English show no sign of possessing.[18] Naturally the primary linguistic data available to Spanish-acquiring children also contains such forms.

(124) a. los míos no los voy a poner
det mine not det going.1sg to put.inf
'Mine I'm not going to put there' (Koki, Montes corpus—age 2;11)

b. esto que estaba pegado ahí dónde está?
this that was stuck there where is
'Where's this thing that was stuck up there?' (Koki, Montes corpus—age 2;7)

Both of these forms are examples of evidence for the fact that Spanish uses the CP layer frequently: topicalized and focused objects, often involving clitic left-dislocations; topicalized and focused subjects; and objects and subjects that precede wh-phrases point toward a need for positions higher than TP in order to get Spanish off the ground.

Additionally, there is as yet no consensus in the literature about where overt preverbal subjects surface in Spanish declaratives, but several prominent proposals place these in the CP layer, either in SpecTopP or in another illocutionarily conditioned position (Ordóñez, 2000; Grinstead, 1998, *et seq.*).

[18] As far as I can tell, no research has been published to document this absence, but in my reading of many English child corpora I have not found such fronting, except on the very rare occasion in the *bilingual* data:

(1) the piggies what's that? (Simón, FerFuLice corpus, file 24c_02—MLU 2.63)

Had this kind of fronting existed in monolingual English acquisition, an article that in all probability *would* have introduced evidence of it, given that the author investigates the implications of residual V2 in acquisition, does not (Westergaard, 2007), leading me to assume that my searches have turned up the true pattern in monolingual English acquisition.

A final source of evidence that the C-domain is active early in Spanish-acquiring children's grammar is their tendency to respect target information structural constraints, in particular the use of *pro* (or the omission of the subject) for at-issue subjects and full DPs for new ones (Paradis and Navarro, 2003). While TP, as a component of the extended verbal projection, has to do basically with matching semantics to syntax, it is in the CP where*both* of these to get aligned to the discourse. Because CP is a higher structure and yet Spanish-acquiring children respect the information-structural constraints that accompany access to a CP, behaving as if their grammar had it and its contents in place early.

We thus several strong empirical reasons to believe that children acquiring Spanish have a CP early, which on our hypothesis can be utilized in the English grammar: (a) evidence for the need for a CP abounds in Spanish child-directed speech, and (b) children use CP-dependent constructions productively from early in their linguistic development.

The English target strata of which I argue Spanish facilitates the development are produced in (125), as an elaboration of (106); the elaborations are based on Grimshaw (1997), with a few additions of the constraints utilized here that she does not use.

(125) {ParseT, ParseQ, *LxHdMv} ≫ OpSp ≫ {EPP, ObHd} ≫ {Fill, Stay, *F^2, *F}

Spanish, on the other hand, swaps the position of *LxHdMv for that of Fill (126): Fill violators are ruled out (virtually categorically) in Spanish, while, as discussed earlier, *LxHdMv must be low to allow for V-to-T.

(126) {ParseT, ParseQ, Fill} ≫ OpSp ≫ {EPP, ObHd} ≫ {*LxHdMv, Stay, *F^2, *F}

My claim, in short, is that facilitation arises because Spanish pushes most of the constraints that need to be demoted down toward the bottom of the hierarchy earlier than

English possibly could: all of the ECONOMY of structure constraints—the *F^n family of constraints—that cause English-acquiring children's early productions to lack tense and agreement 'get out of the way' of the FAITHFULNESS constraints early—the PARSE family of constraints—*because* the Spanish primary linguistic data has more overt reflections of the need to satisfy those constraints. That is, Spanish supplies evidence *both* that tense must be parsed *and* that a projection above TP must be available. As Goodall (2007) writes about the early perfect production of *wh*-questions by Spanish monolingual children, here, too, in the case of the English *wh*-questions of Spanish-English bilinguals, "it could be no other way"—but only if an integrated architecture is embraced.

Having embraced this architecture, I turn back to the Optimality-Theoretic account of the facilitation facts evident in the corpus data, and include an analysis of how acquiring Spanish could have led English-dominant children to produce more non-inverted *wh*-questions than their monolingual counterparts. I build on the account of facilitation of the copula that was motivated and presented in the previous chapter: in light of the *contrasts* between the target *wh*-question structures in Spanish and English, an addition to the architectural toolbox, 'splitting-and-tagging', is required to capture the distinct *wh*-question phenomena.

3.5.1 Splitting-and-tagging mechanism

Spanish *wh*-questions only utilize structure through TP, while English *wh*-questions need a full CP structure.[19] The commonalities between the English and Spanish *wh*-questions,

[19]This claim contrasts with my earlier account of the facilitation phenomenon (Hsin, 2012), in which I claimed that the *wh*-word or -phrase in Spanish raised all the way to SPECCP. But we have seen arguments against that proposal both from the Spanish syntax literature and from the process of harmonic bounding in OT, such that that structure is likely not entertained by speakers of Spanish (least of all monolingual ones).

however, are several: they satisfy many of the same constraints, they beat their competitors by satisfying FAITHFULNESS, and they violate at least two common constraints. And most crucially, the constraints that are violated by the English *child* winners—by those candidates that fail to parse Tense or to satisfy structural constraints—are not violated by the Spanish winner, nor by what we can assume are Spanish winners for non-*wh*-question inputs.

These commonalities coupled with the possibility of splitting constraints in response to language-specific satisfaction conditions form the crux of the present proposal for capturing bilingual language development within a single OT grammar. Constraint-splitting has occasionally been proposed in the literature to account for lexical stratification in phonology: words imported into a language are often subject to different constraint rankings depending on how 'assimilated' they have become, i.e., roughly on how long they have been used in the language (Ito and Mester, 1995; Fukazawa, Kitahara, and Ota, 1998, on Japanese; Coetzee, 2009, on Dutch). Yet constraint splitting is also akin to the rather basic concept of *constraint families* in OT: most generally we have two families, FAITHFULNESS and MARKEDNESS, and within these, there are more specific families of constraints, such as the PARSE family of FAITHFULNESS constraints (e.g., Legendre et al., 2004) or, at an even finer grain, the X-OPSP family of MARKEDNESS constraints (which have been argued by Baković, 1998, to govern the distribution of inversion and non-inversion across dialects of Spanish). Whether the families arise in response to input or whether they are a part of our linguistic endowment, their existence permits the elegant explanation of phenomena that differ cross-linguistically in systematic ways.

Briefly, before looking at *wh*-questions, let us examine a smaller example of one crucial contrast and the way in which a bilingual grammar could readily accommodate it. In Spanish, satisfaction of ParseT always coincides with a violation of both Stay as well as *LxHdMv, while in English Stay and ObHd are violated:[20]

laugh(x), (x = Maria), T = past, lang = EN>	ParseT	*LxHdMv	ObHd	Stay
☞ a. [Maria $e_{past\rightarrow}$ [t_{subj} laughed]]			⊛	⊛
b. [*e* laughed [Maria t_v]]		*!		*

Table 3.12: Ranking for English, winner 'Maria laughed'

<laugh(x), (x = Maria), T = past, lang = SP>	ParseT	ObHd	*LxHdMv	Stay
a. [Maria $e_{past\rightarrow}$ [t_{subj} laughed]]		*!		*
☞ b. [*e* laughed [Maria t_v]]			⊛	⊛

Table 3.13: Ranking for Spanish, winner 'se rió María' *laughed Maria*

English, however, generally rules out lexical head movement, while the existence of that kind of movement is basic to Spanish. This sets up a conflict that has to be resolved by the grammar. In response to evidence of verb-raising in Spanish,[21] bilingual children's grammar should *split* the *LxHdMv constraint so that, depending upon which language feature is present in the input, the desired candidate will win for that language. Tableau 3.14 presents an example of the simplest variant of the outcome of the splitting process,

[20] I deal with affix-lowering in English by representing the T head as an empty head whose Tense feature is checked on the in-situ lexical verb. Nothing in particular should be made of this.

[21] Evidence for this was reviewed in the previous chapter (§2.5.3.

and the subsequent selection of the winner. It may be helpful to think of the split, tagged constraints in terms of a question, italicized below, in a slightly different way from how the traditional constraints were presented.

(127) No Lexical Head Movement–English: *LxHdMv$_{EN}$

a. *English lexical heads do not move.*

b. Satisfied whenever an English lexical head remains in its base-generated position. Violated whenever an English lexical head moves and leaves behind a trace. *In other words, if there is any movement of a lexical head, is it an English one? If so, *LxHdMv$_{EN}$ incurs a violation.*

(128) No Lexical Head Movement–Spanish: *LxHdMv$_{SP}$

a. *Spanish lexical heads do not move.*

b. Satisfied whenever a Spanish lexical head remains in its base-generated position. Violated whenever a Spanish lexical head moves and leaves behind a trace. *In other words, if there is any movement of a lexical head, is it a Spanish one? If so, *LxHdMv$_{SP}$ incurs a violation.*

In this way we establish an elegant procedure for evaluating the effect of a split-and-tagged constraint: first we evaluate whether an untagged version of the constraint would be violated by an untagged version of the input, and *then* we determine whether that violation should contribute to the optimization. Alternatively, *Eval* could *start* by searching the input string for a language tag that matched the constraint's language tag, then check each constituent with the same language tag for whether it violated that constraint, but that algorithm seems to invert the usual evaluation process. It would return far more 'misses'

<laugh(x), (x = Maria), T = past, lang = SP>	PARSET	*LXHDMV$_{EN}$	OBHD	*LXHDMV$_{SP}$	STAY
a. [Maria$_{EN}$ *e* [t$_{subj}$ laughed$_{EN}$]]		*!	*		*
☞ b. [*e* laughed$_{SP}$ [Maria$_{SP}$ t$_{v}$]]				⊛	⊛

Table 3.14: Ranking of bilingual grammar, Spanish input → Spanish winner

than 'hits', a sort of 'false positive' in the first step of the algorithm, given that in a non-code-switched utterance all constituents will have the same language tag. More efficient would simply be to check for a violation of the untagged constraint, in the usual way, followed by a second check, of the single constituent, to determine whether it had a language tag in common with the constraint.

Tableau 3.14 oversimplifies the issue in an important way. With a new *lang* feature in the input, *Gen* would have output additional alternative candidates that varied along the lines of whether the language feature were correctly parsed. I assume that this correct parsing effectively means that each lexical item's language corresponds to the tag it possesses within the candidate (e.g., $laughed_{SP}$ is equivalent to the surface form *cantó*). (129) shows the crucial subset of candidates that *Gen* outputs for the input <laugh(x), (x = Maria), T = past, lang = SP>.[22]

(129) New candidates for 'se rió Maria' *Maria laughed* generated by *Gen* in response to <lang = SP>

a. [Maria_{EN} $e_{\text{past}\rightarrow}$ [t_{subj} $\text{laughed}_{\text{EN}}$]]

b. [Maria_{SP} $e_{\text{past}\rightarrow}$ [t_{subj} $\text{laughed}_{\text{SP}}$]]

c. [e $\text{laughed}_{\text{SP}}$ [Maria_{SP} t_{v}]]

d. [e $\text{laughed}_{\text{EN}}$ [Maria_{EN} t_{v}]]

Evaluating these candidates against the constraint ranking in Tableau 3.14 yields the right

[22] Another set of candidates should in principle be added—candidates for which some lexical items are tagged with one language and some with the other. The candidates would violate a new FAITHFULNESS constraint, PARSELANG, which operates in just the same way as the other PARSE constraints: when a feature in the input is not reflected/reflected incorrectly in a candidate, a violation is incurred. Such a constraint would rule out these code-switched candidates in this case, and I presuppose for the duration of the present discussion that that constraint is highly ranked, unviolated by the winners. How to tease this apart for the case of code-switching that *does* surface will be discussed briefly in the conclusion.

result, as Tableau 3.15 demonstrates. The general effect of splitting and tagging constraints is to allow *Eval* to 'overlook' the relative constraint rankings that are responsible for capturing the 'parametric' contrasts between languages. Several benefits are inherent to this strategy, as distinct from a typical PandP approach with two grammars. First, only those constraints that do show different violation profiles across a bilingual's two languages will undergo this splitting-and-tagging process, which permits predictions to be made about bilingual grammatical development across typologically similar and distinct languages. Second, because there may be some fuzziness in the level of 'commitment' a speaker has to the language of a given proposition, the grammar may at times—in the face of an other-language prime, or in the face of an unusual construction—evaluate an input against (some subset of) wrong-language constraints, resulting in 'errors'. Because we know that these sorts of production errors exist (cf. Grosjean, 1989), having a formalized explanation is naturally desirable.[23] And third, in principle we could track developmentally the process of (a) reranking from the initial state in response to primary linguistic data, (b) encountering incompatible input-output pairs that would require a reevaluation/reclassification of a given constraint, and (c) splitting and reranking (at least) one of the two newly tagged constraints in order to correctly maps inputs to outputs for each language.

3.5.2 The final bilingual ranking deriving *wh*-questions

Having developed a way of capturing contrasting violation profiles across languages within a single grammar, we can at last turn to applying that method to *wh*-questions. First I

[23] Whether this could be formalized as a gradient commitment is beyond the scope of this dissertation but is a question that I would be curious about pursuing.

<laugh(x), (x = Maria), T = past, lang = SP>	PARSET	*LXHDMV$_{EN}$	OBHD	*LXHDMV$_{SP}$	STAY
a. [Maria$_{EN}$ $e_{past\rightarrow}$ [t$_{subj}$ laughed$_{EN}$]]			*!		*
b. [Maria$_{SP}$ $e_{past\rightarrow}$ [t$_{subj}$ laughed$_{SP}$]]			*!		*
☞ c. [*e* laughed$_{SP}$ [Maria$_{SP}$ t$_v$]]				⊛	⊛
d. [*e* laughed$_{EN}$ [Maria$_{EN}$ t$_v$]]		*!		*	*

Table 3.15: Ranking of bilingual grammar, Spanish input → Spanish winner

discuss the pair of constraints that must be differently ranked for the two languages—*LxHdMv and Fill—and, second, present the final target ranking, with the relevant optimization for each language.

As for the constraints that reside in different strata for English and for Spanish, there is evidence to suggest that the pull of Spanish is strong on the English of bilinguals, leading to some interesting errors—occasional verb-raising in English *wh*-questions (130), and also doubled inflectional marking on *wh*-questions' auxiliary and lexical verbs (131).

(130) mommy, what says this? (Simón, FerFuLice 29_01)

(131) a. why did you told him? (Leo, FerFuLice 56a_01)

b. mommy why does it goes in? (Simón, FerFuLice 48_01)

These kinds of errors suggest that *LxHdMv is split early and demoted beneath Stay in the bilingual child's grammar, presumably in response to the abundant Spanish data that suggests that movement of lexical heads *should* be possible (and perhaps especially in contexts of multiple movements). Explicit correction (provided by caregivers) of the latter error type may help the grammar to maintain the split and allow the English-related variant to rule out movement of lexical heads of that language, while continuing to permit it when the input and the candidates reflect Spanish features instead.

The case of Fill is similar: this constraint needs to be ranked low for English and high for Spanish. Because it is a Faithfulness constraint, Fill should start low for all speakers—but other (Spanish-)violated constraints, particularly Economy constraints, approach Fill more quickly than they would with English input alone. Because candidates that violate other Faithfulness constraints get ruled out by the ranking in which Economy constraints have moved toward the bottom of the ranking, yet *LxHdMv rules out head movement in English, we end up with *do*-containing candidates as winners in English, while in Spanish verb movement proceeds without issue. The final partial ranking for Spanish-English bilinguals' *Spanish* object *wh*-questions, then, is shown in Table 3.16, while the *English* one is in Table 3.17. I have omitted the constraints that the target forms for both languages satisfy for ease of reading; in response I have also removed the candidates that were eliminated by violations of the constraints that both winners satisfy.

Object question, lang = SP	*LxHdMv$_{EN}$	Fill$_{SP}$	*LxHdMv$_{SP}$	Stay	*F^2	Fill$_{EN}$
a. [$_{CP}$ qué [do$_{SP}$] [$_{TP}$ Mamá t_{aux} [$_{VP}$ t_{subj} ver t_{wh}]]]		*!		***	*	
☞ b. [$_{TP}$ qué ve$_v$ [$_{VP}$ Mamá t_v t_{wh}]]			⊛	⊛⊛		

Table 3.16: Bilingual target ranking for Spanish

Object question, lang = EN	*LxHdMv$_{EN}$	Fill$_{SP}$	*LxHdMv$_{SP}$	Stay	*F^2	Fill$_{EN}$
☞ a. [$_{CP}$ what does [$_{TP}$ Mom t_{aux} [$_{VP}$ t_{subj} see t_{wh}]]]				⊛⊛⊛	⊛	⊛
b. [$_{TP}$ what sees$_v$ [$_{VP}$ Mom t_v t_{wh}]]	*!			**		

Table 3.17: Bilingual target ranking for English

Regarding the absence of strict structural overlap In the course of this exposition, the reader may have occasionally wondered whether there were not a more straightforward way of predicting the documented facilitating transfer—more along the lines of the account in the previous chapter, in which surface and deep-structural overlap between Spanish and English, coupled with the lexical transparency afforded by Spanish, led to precocious development of target copula usage in English. Given the three alternative abstract structural representations presented for Spanish *wh*-questions in §3.2.4, it might have been natural to select either the representation in Figure 3.3 or in Figure 3.4; that these use a CP for their (unmodified, non-negated) *wh*-questions presents a welcome parallel between the Spanish and English structural representations. There are several motivations for refraining from adopting either of these representations, however. As discussed in §3.2.4, a strict analogy between the English target structure and the Spanish one is subject to many empirical criticisms: English has a matrix/embedded distinction that Spanish lacks; many dialects of Spanish allow non-inversion in less argumental *wh*-questions, while in English this is strictly forbidden; Spanish has positions that allow fronted objects to intervene between an adjunct *wh*-phrase and a finite verb, while English again does not.

A looser analogy between the two languages' *wh*-question structures, but one that still preserves the claim that CP is used in each, was drawn out in §3.2.4; while the structure proposed there has been argued to have better empirical coverage for Spanish, accommodating that proposal in an economy-based theory would require one to contrive some case-specific constraint so important that *Eval* should not be bothered by an empty head *and* an empty specifier position. In this system, that is, projecting empty positions whose presence does not serve to satisfy any independently-motivated constraints is bound to be penalized. But what about the evidence in (82), (83), (84), and (86), showing that the *wh*-phrase is regularly at a structural remove from the finite verb? In utterances involving sentential adverbs or negation, more structure *is* projected, to allow the *wh*-operator to take scope over the whole clause, while leaving the finite verb in T^0. Such a proposal has the virtue of being maximally economical, not ruling out the usual NegP (broadly, phrasal) analysis of sentential negation in Spanish and closely related Romance languages (cf. Zanuttini, 1997) but also not explicitly reserving pieces of the extended verbal projection as the target sites of specific subtypes of movement.

That unmodified Spanish *wh*-questions use only TP is supported by an interesting OT analysis developed by Gutiérrez-Bravo (2013), which utilizes the notion of a 'pole', a (leftmost/highest) specifier position, preceding the verb, that can be filled with different constituent types, e.g. a subject in (132) and an adverb in (133).[24]

(132) Sergio vendió su coche.
Sergio sold his car
'Sergio sold his car'

(133) Ayer vendió Sergio su coche.
yesterday sold Sergio his car
'Yesterday Sergio sold his car'

Which constituent occupies the pole position for a given utterance is conditioned by a Markedness subhierarchy that embodies a preference for more salient arguments (e.g., agents rather than patients) to move to the pole. The effect is that Spanish gets characterized as something of a V2 language (for both declaratives and questions), but not strictly so, given that more than one constituent can be fronted; the *most harmonic* constituent will occupy the pole while other fronted constituents will occupy lower specifier positions in the extended inflectional projection. In a standard *wh*-question, then, it is the *wh*-phrase that is in the pole: the specifier of TP, as in (134). In a *wh*-question with sentential negation

[24]The definition was inspired by Grimshaw (1997)'s EPP constraint, which affected subjects by requiring that the highest specifier position be filled, implicitly by a subject; Gutiérrez-Bravo (2013) effectively extends that notion to cover more phrase types, and in so doing also builds on the tradition, inaugurated by Déprez (1989), of taking SpecTP not strictly to be either an A- or an A′ position.

on this account, the *wh*-phrase again ends up in the pole, but this time the pole position is the specifier of NEGP, again deriving the target order, utilizing two inflectional layers (TP and NEGP), while avoiding the projection of superfluous structure that would violate a constraint like OBHD, as in (135).

(134) [$_{TP}$ cuándo$_k$ sales$_i$ [$_{VP}$ t$_i$ t$_k$]] 'when do-you-leave?'

(135) [$_{NEGP}$ cuándo$_k$ no [$_{TP}$ *e* sales$_i$ [$_{VP}$ t$_i$ t$_k$]] 'when don't-you-leave?'

Viewed in this light, the fact that Spanish-speaking children, monolingual and bilingual alike, produce utterances like (135) from an early age would indicate not that they have a CP *per se*, but that they are capable of representing more than one layer of structure above VP—and they can do so in a way that accommodates a variety of constituents. (136) shows an early usage of CLLD'd topic, immediately followed by its clitic and the finite verb; (137) uses a more complex structure and does so earlier, fronting the object beyond a temporal adverb.

(136) sí porque mira el dibujo lo tienes que hacer así !
yes because look the picture CL have.2SG to do.INF so
'Yes because look, **the picture** you have to do (it) like this!' (FerFuLice, Leo 37_02)

(137) esto ahora ahora lo lees
this now now CL read.2SG
'**This** you read now' (FerFuLice, Simón 29_02)

Thus both the empirical data and the theoretical system converge on the same conclusion: it is the ability to represent multiple layers of functional structure, developed earlier in Spanish, that facilitates the acquisition of the target *wh*-question structure in English. Because English satisfies EPP not by raising a lexical verb to T^0 but uniquely by raising the subject to SpecTP, in order for the position of the *wh*-phrase to satisfy OpSp another layer of functional structure must be projected: one that is not needed in simple Spanish *wh*-questions. But the need for the specifier of the highest projection to be filled, and for its head to be filled, drives the selection of the optimal Spanish structure just as it does the English one, hence the possibility of facilitation in the absence of direct structural correspondence across languages.

3.6 Conclusion

In this chapter I have further elaborated the Optimality-Theoretic formalism that was developed to account for facilitation in the extended verbal projection—in TP, involving copulas and finiteness—to capture facilitation in CP, where strict surface overlap between the relevant Spanish and English constructions is absent, *as is strict overlap in the semantically-equivalent abstract structural representation*. By splitting constraints and tagging them *by language*, it is possible to manage contrasting violation profiles across the two languages that the young bilingual acquires. This possibility begins to point the way toward a robust theory of bilingual adult maintenance, but even the stark problem posed by acquisition demands—the existence of 'parametric' contrasts between Spanish and English with respect to verb raising and the related *do*-support—is neatly dealt with by allowing those constraints which govern such apparently parametric contrasts to start out as a single constraint, thus not requiring any modifications to the initial state of the system.

Beyond showing that this Optimality-Theoretic proposal for formalizing the integration hypothesis works in the case now of two phenomena that challenge the proposal in different ways, I close here by presenting a pair of additional predictions made by the system. More general predictions will be explored once the extent of the data on *wh*-questions is presented—in the next chapter, which contains the experimental results—but here I discuss corroborating evidence for facilitation as well as an implication of the model that has so far been proposed.

First, because there is a shared demotion of *F constraints, there should be evidence that children have the CP structure available not only for English *wh*-questions, but also for other C-related constructions. The example in fn. 18, here as (138), shows that even before MLU 3 a bilingual child indeed produces a structure that unequivocally requires more structure than a TP alone.

(138) [the piggies [what's that? (Simón, FerFuLice, 24c_02—MLU 2.63)

It might be claimed that an utterance such as this one is not the best supplementary evidence for the use of a CP, since it is possible that 'the piggies' is adjoined to TP and with the *wh*-word in SPECTP (despite it being an argument whose base-generated position is occupied by an overt resumptive—and in this case deictic—pronoun). Another pair of Spanish examples make the point more directly, involving the fronting of an adjunct and a *wh*-phrase in the presence of negation. Since negation requires its own head position, the utterances in (139) and (140) contain at least two functional projections above TP, and possibly three (for the fronted constituent).

(139) [con este [no [tenemos la otra parte de esta .
with this-one not have.1P the other part of this
'With this thing we don't have the other part of that' (Leo, FerFuLice, 33c_01)

(140) [por qué [no [sabías [que iba aquí ?
why not know.2s.IMP that go.3s.IMP here
'Why didn't you know that it went here?' (Leo, FerFuLice, 37_02)

During the same period in which facilitation of *wh*-questions has been documented here, the children also make use of CP in embedded questions, even producing the occasional error that indicates the non-target-like appropriation of CP into a *Spanish* embedded question, leading to English-like non-inversion:

(141) * quieres ver cómo los juguetes se caen o no ?
want.2s see.INF how the toys CL fall or no
'Do you want to see how the toys fall down or not?' (Leo, FerFuLice, 28_02)

The researcher asks, 'What did you say?', to which Leo then responds with the target Spanish order. Thus we have evidence even from the early files of the FerFuLice data that the bilingual children use multiple functional projections, just as they should if they have them available for *wh*-question productions. In short, the facilitated development of the availability of functional structure here is not a highly localized phenomenon, causing only *wh*-questions to be produced in a target-like way; rather, multiple layers of structure provide young children with a way to express information-structurally rich propositions according to adult norms.

A second prediction made by this account cannot be immediately verified here, but the next chapter will go some way toward testing a variant of it. Because the splitting-and-tagging mechanism is a product of *learning*, and learning itself is the interaction between exposure and (attempts at) production, the model predicts that exposure to one language may influence productions in the other either positively or negatively—and that it would take further exposure, and perhaps purposeful correction, to arrive at the correct ranking that could accommodate both languages. While I will address the negative outcome of other-language exposure upon production in Chapter 4, here I wish to point out that this model predicts that facilitation could be accelerated if more exposure to the facilitating language were supplied. It is important that the recipient language have met some threshold of proficiency before facilitation can arise, but once this threshold is met, then my account predicts that young bilingual children who hear structurally rich utterances in Spanish should see their *wh*-questions facilitated—in spite of the fact that in some of the more granular respects there is *not* surface overlap between the two languages.

Chapter 4

Cross-linguistic interference: The flip side of facilitation

4.1 Introduction

In the previous two chapters, we saw that implementing the integration hypothesis of bilingual grammatical architecture in Optimality Theory supplies elegant explanations for cross-linguistically motivated facilitation. In this chapter I address in contrast CROSS-LINGUISTIC INTERFERENCE, the 'flip side' of facilitation whereby bilingual children produce utterances that are *qualitatively* different from those produced by their monolingual counterparts. Inasmuch as facilitation effectively erases from bilinguals' speech the optionality that often characterizes monolinguals' productions, interference introduces *more* optionality, leading to bilingual-specific errors (or inflated error rates relative to monolinguals'). So far I have focused on issues surrounding representations for which the population of interest does not succumb to processing difficulties—failing to entertain a grammar that can project as much structure as is needed, for instance. Therefore I have not had a need to discuss real-time production pressures, but, with the introduction of cross-linguistic interference, that changes. Therefore some attention must be paid not only to the interference phenomenon itself and to the grammatical architecture that underlies it, but also to the circumstances in which it arises; I will flesh out that claim in the course of presenting two experiments that expose Spanish-English bilinguals' tendency to produce interfered-with constructions.

By way of organizing the discussion, I first review several existing findings of elicited but spontaneous interference in bilingual development (§4.1.1). That interference appears more often in experimental contexts than in spontaneous, impromptu ones suggests that the experimental *environment* may play a key role in children's tendency to produce more or less target-like utterances. Thus while the first of the novel experiments that I present follows a traditional picture-description protocol, the second one utilizes the protocol of STRUCTURAL PRIMING; a second introductory section therefore reviews the seminal and distinctly relevant findings from the priming literature as well. I then present two experimental studies, the first a follow-up on *wh*-questions (§4.1.2) and the second a novel INTERFERENCE PRIMING task with noun modification (i.e., adjective-noun combinations: §4.1.3). In discussing the results of each of these studies, I offer a sketch of the OT analyses that correspond to the findings to show the extent of phenomena that the integrated bilingual grammatical architecture can explain when implemented in this way.

4.1.1 Spontaneous interference

The term SPONTANEOUS INTERFERENCE can either refer to the interference that sometimes emerges in the course of a bilingual's extemporaneous speech, as opposed to an intentionally elicited utterance—or it can refer to an utterance that displays interference in an experimental context but with which the stimulus utterance of the experiment did not share any crucial structural traits. In the course of a conversation with her father, Cantonese-English bilingual Sophie produces an utterance containing several errors; her father had not *requested* that she use this structure or that, and yet her response diverges from the target:

(142) Father: Why doesn't Alicia speak English?

Sophie: He's bigger first. Then he know already. (Yip et al., 2007, Sophie 5;03)

Sophie's response represents something of an 'unforced error', completely spontaneous finiteness and gender mistakes that were not suggested by any structures or contents of the question her father directed at her. She does not reflect the grammatical conservatism that was discussed, e.g., as a possible explanation for the absence of (ungrammatical) insertions of unanchored aspectual markers in predicative utterances (p. 92). That is, Sophie does not restrict her production to an utterances that she *knows* is right in the context—given that this utterance is not. Instead of omitting the non-target component that her grammar generates (e.g., the unmatched gender of the subject pronoun), she produces it. She also does not inflect the main verb of her second sentence—a token of interference that may reflect her exposure to Cantonese, a language with no bound tense marking (i.e., tense is not reflected as inflectional morphology bound to the verb).[1]

4.1.2 Experimentally-elicited interference

While Sophie was surely very comfortable with her father and did not feel any particular pressure in responding to him, in an experimental context the social situation is rather different. Usually an experimental participant has just met the experimenter, the two often being left alone together while the parent looks on through a two-way mirror. The young child will also have received instructions on how to play 'a new game', in a new environment, and will find herself corrected by the experimenter when she has given an informative but unanticipated response—in short, the interaction may not feel entirely natural. Hence it is not uncommon to discover that children produce errors in experimental settings that they do not typically produce in spontaneous conversations with familiar interlocutors, several examples of which I will review shortly. But crucially, they are still *spontaneous* errors, in contrast to *primed* errors, which emerge *because of* some feature of the experimental stimulus.

General overview

Collecting a corpus of child speech is difficult, even in the monolingual case. The difficulty of collecting a longitudinal corpus is often compounded for bilingualism by customary extended trips to the non-native parent's home country (cf. Fernández-Fuertes and Liceras, 2010), by shifts in the child's exposure to one language or the other (cf. Soriente, 2007), and, most problematically, by the fact that in many bilingual marriages the parents interact with

[1] This sort of spontaneous, unrestricted context in which interference is found is also represented by many of the studies mentioned in Section 1.3.3 and specifically by the Döpke (1998) study that was discussed there.

one another in a language of which only one of them is a native speaker, leading the child to be exposed to a contact variety of the parents' common language rather than a 'pure' monolingual variety (cf. Paradis and Navarro, 2003). Since contact varieties of languages often feature some characteristics of other languages (Thomason and Kaufman, 2001) and in this kind of scenario are usually a species of second language (an 'L2': Valdés, 2005), child utterances that sound like *errors* to the linguist's ear may be perfectly 'target-like' for the child—because that is just how that type of utterance is formed in the (variety of the) language to which she is exposed.

These potential confounds can be circumvented by collecting data from a large sample of children and systematically gathering information about their language exposure and proficiency/competence—that is, by conducting experiments. Unlike spontaneous speech corpora, experiments can be designed to virtually guarantee that the constructions of interest will be used at an interpretably high rate of frequency. This is a boon to theoreticians in spite of the fact that, as mentioned above in §4.1.2, the setting of an experiment may inflate children's tendency to produce non-target utterances. Nevertheless, we can still take such utterances to be reflective of the child's grammar, without drawing a hard line between 'representations' and 'processing' (cf. Phillips, 1995); after all, participating in an experiment does not cause adults to abandon their mature representations of grammatical structure.[2]

Experimental elicitation with bilinguals frequently tests them on constructions

[2]There is a long tradition of psycholinguistic experiments that elicit speech errors and errors of comprehension such as are not typically found 'in the wild' (e.g., Levelt, 1983; Berg, 1986; Fromkin, 1984), but these typically involve intentionally included additional pressures on the processor, not the mere request for a reply, as the studies in which children's errors emerge do.

that display at least occasional errors in spontaneous speech, or that have differing syntactic representations across children's two languages, in order to investigate the class of proposals of which the central question of this dissertation is one: whether the knowledge corresponding to a given structure is isolated by language or is integrated across them. While my proposal aims to account not only for those constructions whose production does display cross-linguistic influence but also for the ones that do not—providing a broader framework than is typically sought—these studies tend to pick a particular construction that could theoretically be subject to cross-linguistic interference and test children on its production. The two studies reviewed here, Nicoladis (2006) and Strik and Pérez-Leroux (2011), are representative of this model and provide a clear background against which to present the experiments that I have conducted for reasons that will become plain shortly.

Nicoladis (2006) on N-Adj In English, aside from exceptional cases typically involving quantifiers (e.g., *something* ***big***) and sometimes within poetic forms (e.g., "*The little boy* ***blue***. . . "), nouns that are modified by adjectives follow those adjectives: (143a) vs. *(143b).

(143) a. the *purple* **cow**

b. *the **cow** *purple*

The French pattern is more varied than the English—as a general rule, nouns *precede* adjectives: (144a) vs. *(144b).

(144) a. la **vache** *violette*
the cow purple
'the purple cow'

b. *la *violette* **vache**

But there is a class of adjectives that do not occupy the canonical post-nominal position. Instead, very frequent adjectives such as those meaning 'big', 'great', and 'good' tend to occupy a pre-nominal position—just like English adjectives:

(145) a. une *grosse* **étoile**
a big star

b. la *grande* **héroïne**
the great heroine

c. un *bon* **chien**
a good dog

In short, there is some overlap between English and French noun modification constructions, but only with a restricted set of frequently-used adjectives; otherwise, the languages' nouN-Adjective orderings are opposites of one another: English adjectives are pre-nominal and French adjectives are post-nominal. For a child acquiring two languages simultaneously, this may not pose any problem at all if bilingual grammatical architecture isolates one language's knowledge from the other's. But if the languages are integrated in the mind, then the child could interpret her input as 'mixed cues' as to whether adjectives should follow or precede nouns—in certain contexts or with particular adjectives, or in general.

Nevertheless, in the spontaneous speech of French-English bilinguals, it is rare to observe a reversal of noun modification orderings in either language (Nicoladis, 1999, 2002; Paradis et al., 2000). Parallel results have been found in the spontaneous speech of bilingual children acquiring several other language pairs—specifically pairings in which one language (typically the Romance language) has variable noun modification ordering while the other language (typically a Germanic) has strict pre-nominal adjective ordering (e.g. Bernardini, 2003; Volterra and Taeschner, 1978; Schlyter, 2001). Children tend to make *a few* errors, in both the language with variability and the language without, but all in all their adjective placement relative to the noun it modifies is target-like from the onset of such two-word utterances.

Nicoladis (2006) sought to test whether in an experimental context French-English bilingual children would produce errors that suggested their two grammars were closely enough interconnected that the regularities from, say, English would be taken up for use in French. She designed a task, which was administered to bilingual children (ages 2;11 to 5;3, M = 51.5 months, SD = 6.1) in each of their languages and to comparable monolinguals in their native language, that would elicit tokens of noun modification corresponding to these diverse patterns. Using visual stimuli like the one reproduced in Figure 4.1, the experimenter asked the child to describe the central, different character.

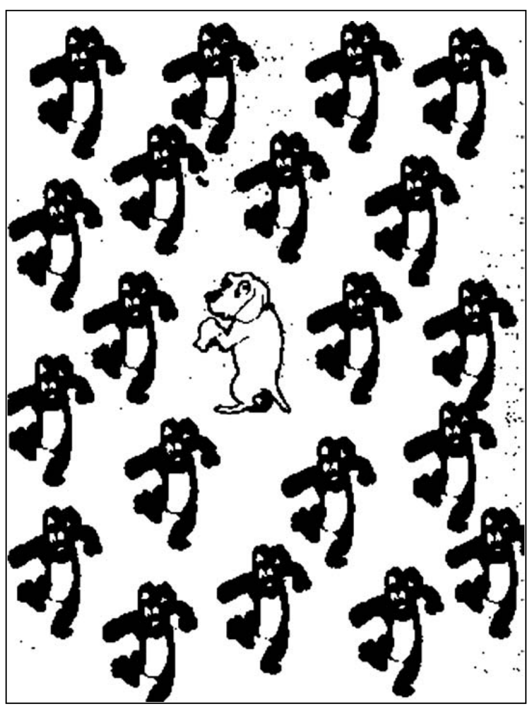


Figure 4.1: Sample stimulus image from Nicoladis (2006)

On a first pass through the visual stimuli, the experimenter drew attention to the characters in the surround, describing them with an utterance as in (146) soliciting no response from the child. After completing this familiarization phase, the experimenter elicited a description from the child participant of the central, different character, asking simply "What's that?" (and in French, *"C'est quoi ça?"*).

(146) "These dogs are all happy."

Twenty items were elicited in French and then a differently ordered set of another 20, with the same adjectives and nouns, in English.

In French, participants overgeneralized the basic French rule that adjectives should be post-nominal, placing adjectives that are canonically pre-nominal in the post-nominal slot.[3] In a complementary finding, the stronger these participants' *English* was, the likelier they were to reverse adjectives ($r^2 = 0.360, p < 0.05$), a result carried by the tendency of children with stronger English to place canonically post-nominal adjectives pre-nominally. In French, in other words, while there was a tendency among the entire sample to *misplace* canonically pre-nominal adjectives in post-nominal position—applying the abstract French rule to effectively idiomatic cases—participants with stronger English tended *also* to produce the reverse error, that is, to use pre-nominal adjectives, just like the English pattern.

In English the participants behaved differently from monolinguals in the expected way: they produced more post-nominal adjectives than comparable monolinguals did. A significant negative correlation was also found between English vocabulary and rate of

[3]The French comparison sample was comprised of only 10 participants, in contrast to the 35 bilinguals, so I do not report comparisons wtih them here.

reversals in English: the stronger a child's English, the less likely she is to produce a (non-target) reversal. Nicoladis also found a marginally significant effect of 'Position in French' on the English reversal rates: a 2×2 [Group × Position-in-French] ANOVA yielded $F(1,54) = 3.22$, $p = .08$, indicating that the participants' errors did tend to reflect the corresponding French orderings.

Both of participants' languages showed evidence of cross-linguistic interference, and at a much higher rate than tends to be observed in spontaneous speech corpora. Crucially, even though one language (French) has a more variable pattern of noun modification, conditioned on semantics and on somewhat idiomatic adjective positions, and the other language (English) has a very fixed order, children used one language's rules to inform the orders they used in the other. This is crucial because this generalization is incompatible with the proposal of Hulk and Müller (2000) that was presented in the introductory chapter—it is not simply the case that a language without variation provides confirmatory evidence that only that pattern should be used in the other. Instead, regularities from each language can be used in productions of the other—just as the integration hypothesis, in contrast to Hulk and Müller's isolation hypothesis, would predict.

Strik and Pérez-Leroux (2011) on wh-questions The reader is well familiar with many of the issues surrounding the acquisition of *wh*-questions in English and in Spanish by this point, but other pairs of languages can pose different issues. Dutch *wh*-questions, like Spanish and English ones, obligatorily front their *wh*-phrases (in contrast to a language like Mandarin, which leaves them in their base-generated position lower in the clause). Spoken French, however, possesses multiple options for the formation of *wh*-questions, including an *in situ* option and a non-inversion option. It is the simultaneous acquisition of these two paradigms that Strik and Pérez-Leroux (2011) investigate experimentally.

Strik and Pérez-Leroux (2011) elicited Dutch matrix *wh*-questions, of the same general sort as were analyzed in the previous chapter, from 5- and 7-year-old French-Dutch bilingual children. They focused in on a subset of the *wh*-question paradigm of French that might have influenced production of the canonical Dutch patterns, as in Table 4.1.[4]

	In-situ	**Inversion**
French	S-V-*wh* (147a: true question and echo)	*wh*-S-V (147b) *wh*-esk-S-V (147c) c'est-*wh*-que-S-V (147d) *wh*-V-S (147e: low frequency)
Dutch	S-V-*wh* (148a: echo)	*wh*-V-S (148b: only possible)

Table 4.1: Surface order of matrix questions expected in Strik and Pérez-Leroux (2011) study

(147) *French:* "Who do you film?"

a. Tu filmes qui?
you film who

b. Qui tu filmes?
who you film

c. Qui est-ce que tu filmes?
who is-it that you film

d. C'est qui que tu filmes?
it-is who that you film

e. Qui filmes-tu?
who film-you

(148) *Dutch:* "Who do you film?"

[4]Note the variety of grammatical options that Spoken French presents, as opposed to Dutch; note also that *in situ wh*-phrases *are* possible in Dutch, but only in echo questions, which have been argued *not* to have the [+Q] feature that typically triggers inversion in languages like this one (e.g., Pesetsky, 1987).

a. Wie film je?
   who film you

b. Je film wie?
   you film who

They elicited questions with a variety of *wh*-words by presenting stimulus images that had a missing component, which the child could ask about, as in Figure 4.2: "Who are you pushing, Rabbit?".

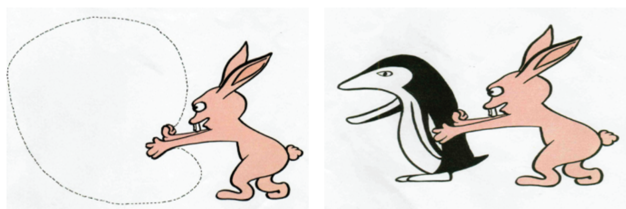


Figure 4.2: Sample visual stimulus from Strik and Pérez-Leroux (2011)

The monolingual child and adult participants performed at ceiling, always fronting their *wh*-words in Dutch. The bilinguals also produced more *wh*-fronted questions than any other order, but in addition they produced non-inverted questions (149) and *wh-in-situ* questions (150). (The misplaced lexical item is bolded in the following examples.)

(149) a. [*] Waarom je **huilt**?
   why you cry.2SG
   'Why are you crying?'

b. [*] Wie je **ben** aan het kussen?
   who you be.2SG to the kiss.INF
   'Who are you kissing?'

(150) a. [*] Jij doe **wat** giraffe?
   you do.2SG what giraffe
   'What are you doing giraffe?'

b. [*] Girafe jij likt **wie**?
giraffe you lick.2SG who
'Giraffe, who are you licking?'

These types of responses show that options that are by no means typically available to children acquiring Dutch, including non-inversion and *wh-in-situ*, are readily produced by bilingual French-Dutch children at a relatively old age (age 5–7). Dutch monolinguals never produce *wh-in-situ* and only occasionally produce errors involving inversion (Strik, 2008), but even these are not the same ones that are produced in this elicitation experiment. Therefore it is clear that (1) experimental studies can be illustrative sources of information about bilinguals' grammatical competence and that (2) bilinguals' errors in one language can often be traced back to the other language, including under circumstances that are generally taken *not* to give rise to cross-linguistic influence of any kind (e.g., involving the core syntax as opposed to the interfaces, cf. Hulk and Müller).

4.1.3 Primed interference

We have already seen that cross-linguistic interference is more reliably found in experimental contexts than in truly naturalistic ones. In a sense, then, experiments *draw out* the underlying grammatical competence of bilingual children (and of monolinguals as well, of course)—to show that they are able to recruit structures that should be used only for one language in the other language. Structural priming, a procedure commonly used in psycholinguistics, supplies another means of *drawing out* structural options: if there are two distinct possible syntactic structures with which to articulate a proposition, then a person who has just heard one of those options tends to use that same option when responding with a propositionally similar utterance. Structural priming effectively boosts the likelihood that a person will use one construction or another, as I review briefly here before addressing the issue more directly in the presentation of my experimental priming study.

Review of structural priming

Structural priming is a nuanced phenomenon, in which a person's use of a linguistic structure—whether in comprehension or production—increases the likelihood that she will use that structure again in her next linguistic act. In other words, it is the tendency to produce sentences containing previously experienced syntactic structures (Bock, 1986).

Before Bock (1986), priming had been observed in social situations, and researchers' observations led them to offer a number of explanatory hypotheses around the phenomenon. At various points priming was understood to be a lexically driven phenomenon, a socially motivated matching of form, a simultaneous process of, e.g., recalling a question while formulating its answer, and a persistence of communicative intentions or discourse strategies. Bock had a stroke of insight, that if she could eliminate *all* of these factors and still see structural priming, then something altogether less social and more cognitive would have to be at play. Her (1986) paper was the first in a long string of productive studies probing speakers' tendency to reuse the same structural representation; the active/passive alternation (151) and the prepositional object/double-object dative (152) are perhaps two of the best known.

(151) a. HEAR: *One of the fans **punched** the referee.*

SAY: "Lightning **struck** the church."

b. HEAR: *The referee **was punched** by one of the fans.*

SAY: “The church **was struck** by lightning.”

(152) a. READ: *A rock star sold **some cocaine** <u>to an undercover agent</u>.*

SAY:“The old man is reading **a story** <u>to the boy</u>.”

b. READ: *A rock star sold <u>an undercover agent</u> **some cocaine**.*

SAY: The old man is reading <u>the boy</u> **a story**.

Whether the prime utterances are read aloud or read silently, spoken by the participant or played over headphones, when a representation becomes active in a person’s mind it tends to assert itself where it can until that activation diminishes.

Some researchers have interpreted priming as being the result of implicit learning of abstract grammatical relations (e.g., Ferreira, Bock, et al., 2008; Chang, Dell, Bock, and Griffin, 2000; Kaschak, 2007). Others take it to be the result of the alignment of production procedures between speakers (e.g., Pickering and Branigan, 1998). What all of the accounts have in common is that *some* abstract structural representation is necessary; several studies have gone to show that while lexical overlap between stimulus and prime does often *boost* the magnitude of priming (i.e., the priming lasts longer or is more reliably found in participants), no lexical-conceptual overlap is needed. It is the abstract syntactic representation that is shared between stimulus and prime, and it is the abstract syntactic representation that is responsible for the repetition that transfers from one linguistic act to the next—presumably because the representation in both acts is one and the same.

Cross-linguistic structural priming

There is ample support for connection across languages within the conceptual system and within the adult lexicon, with robust and nuanced effects of semantic priming apparent within and across a bilingual's two languages (Schwanenflugel and Rey, 1986; Green, 1998; Perea et al., 2008; Kroll et al., 2008, *inter alia*). Further, the relationship between lexical items and the structures in which they are housed conditions the effects of cross-linguistic structural priming (Schoonbaert et al., 2007; Salamoura and Williams, 2006) and, complementarily, allows for grammatically-constrained code-switching that is dependent upon conceptual schemes as well as grammatical ones (e.g. Daller et al., 2011; Schindler et al., 2008). Moving from questions of the lexicon up to the syntax, it is possible to prime structural configurations cross-linguistically in bilinguals' production just as it is to prime structural configurations within a monolingual's single language (e.g. Hartsuiker et al., 2004; Desmet and Declercq, 2006; Bernolet et al., 2007). As such, the existing findings of cross-linguistic structural priming strongly suggest that the bilingual mind represents only once information that can be used for both languages, at least when it is possible to do so, rather than duplicating and cordoning off the knowledge pertaining to each language. This is precisely the picture that I have painted throughout this dissertation, and evidence from previous studies that even the adult bilingual grammar appears to be integrated, much like that of the child, lends additional credibility to the overall account.

Why interference-priming might not work

I have presented spontaneous cross-linguistic interference in virtually the same breath as cross-linguistic priming—and yet, to my knowledge there have been no attempts to *elicit* interference *experimentally*, using the priming methodology. Studies that (inadvertently) create an environment suitable to interference priming in adult bilinguals have been shown not to elicit interference (e.g. Bernolet et al., 2007)—leading to the provisional conclusion that constructions whose word orders are not shared across languages have representations that are independent as well, and are only linked up to the one language in which they are used. However, I would argue for a different interpretation of the lack of interference found in studies of cross-linguistic priming in adult bilinguals. Even though priming does not cause (proficient) adult bilinguals to produce ungrammatical utterances, the grammar might nevertheless output ungrammatical utterances either at an early stage in the process of sentence generation or even persisting to a later one. However, adults *know* that they *should not* produce ungrammatical utterances, so they suppress them actively.

While my work so far has not afforded me an opportunity to test this explanation, the old aphorism, "The absence of evidence is not evidence of absence," aptly, if blithely, characterizes the situation. If the integration hypothesis is correct, then into adulthood we should still be able to observe signs of a shared grammar, though those signs may become fainter. As far as I am aware, the studies that have placed adult bilinguals into situations in which stimuli presented in one language have structures that would correspond to ungrammatical utterances in the other language have *not* measured response times. But if there is such 'interfering' activation across constructions, then it should be more difficult for a bilingual speaker to switch languages *and* switch structures than it is for her simply to switch languages (as in the case of observed, grammatical cross-linguistic structural priming).

I hypothesize that the control that adults have which allows them to suppress the interference that I am—tentatively—claiming exists in the context of structural priming experiments is of a domain-general cognitive sort: cognitive control. Cognitive control refers to the suite of abilities including attentional control, response inhibition, and working memory, among others (Gardner et al., 1959). Cognitive control is also one of the later cognitive skills to develop in children: some of the simplest cognitive control skills, such as holding information in mind and inhibiting a dominant response, are in place by age 4 but are only used succesfully in highly predictable conditions; more complex skills such as switching between rules ('cognitive flexibility') are still not fully developed at age 13 (Davidson et al., 2006; see also Diamond et al., 2005; Carlson and Moses, 2001). While adults can exercise cognitive control to stop themselves from producing an unacceptable utterance *that their grammar generates*, children perhaps cannot—not because their linguistic system fundamentally differs from adults' but because they cannot control or suppress its outputs. Given preschool children's limited cognitive control abilities, and their relatively well developed linguistic competence, they are the ideal target population for a first investigation into the possibility of cross-linguistic interference priming. And as I will show, Spanish-English bilingual children are indeed susceptible to the priming of interfering structures, confirming an important prediction of the integration hypothesis.

4.1.4 Summary of introduction

Cross-linguistic interference strongly indicates that the representations corresponding to many types of linguistic knowledge are not categorically distinguished by language in the mind of a bilingual. The specific type of cross-linguistic interference that I address here, focused on syntax, makes plain that this representational proximity extends to syntax proper. The remainder of this chapter shows that syntactic interference is found in experimentally elicited *wh*-questions as well as experimentally *primed* modified noun phrases of Spanish-English bilingual preschoolers. For the first phenomenon, I compare an analysis of the results with the proposal of the previous chapter, drawing out contrasts between the populations represented by the corpus analyses and the experimental data. As we shall see, the formalism that has so far been applied to *facilitated* copulas, non-finite root forms, and *wh*-questions requires little elaboration to be adapted to the existence of interference in *wh*-question productions. For the second phenomenon—primed interference in noun modification—I discuss a series of proposals, building on the same integrated OT framework, to capture processing requirements unique to bilinguals.

4.2 Experimental evidence of interference in *wh*-questions from early sequential bilinguals

Spanish-English bilingual child data extracted from spontaneous-speech corpora have been interpreted as revealing a facilitating effect of bilingualism on children's grammatical development, with respect to *wh*-questions: the English *wh*-questions of Spanish-English bilingual children are significantly less likely than the *wh*-questions of monolingual English-speaking children to contain errors of auxiliary/copula omission and lack of inversion. The current study extends the prediction of cross-linguistic influence into the territory of possible *interference* alongside facilitation, by gathering experimental data from a slightly different population from the one so far discussed: while the bilingual children represented in the corpora are virtually 'balanced', i.e., their Spanish is just as strong as their English, the bilingual children available to participate in an experimental study eliciting *wh*-questions tend to be English-dominant,[5] meaning that they may not reap all of the benefits of acquiring the two languages simultaneously (for in the strictest sense the acquisition of the two by these children is indeed not simultaneous). The experimental participants also differ crucially from the corpus children due to the Spanish to which they are exposed, in which inversion is not obligatory for all matrix *wh*-question types. Therefore, to the degree that we can expect, perhaps, some fundamental characteristics of Spanish to transfer into English in spite of more limited Spanish mastery, we may also find that their English reflects some characteristics of *wh*-questions drawn from their Spanish exposure—a mixed result involving both apparent facilitation and some interference as well.

4.2.1 Method

Participants

Twenty Spanish-English bilingual children who were enrolled in Spanish-immersion preschools participated in the task. Three preschools—CommuniKids in Falls Church, VA, CommuniKids in Washington, DC, and Pine Village Preschool in Cambridge, MA—are rep-

[5] The reader may to refer to §1.3.3 for a review of the concept of language dominance.

resented among these participants. In these schools, children are exposed only to Spanish, except when occasionally among themselves they speak English; all teachers only speak Spanish to the children and to each other.[6] Participants ranged in age from 3;1 to 5;3, with a mean age of 4;3. According to teacher reports, all but one student spoke English at home. Thirteen responses (of a possible 20) to a questionnaire probing exposure to and use of English and Spanish indicated that children spoke 'mostly' English at home, while some exposure to Spanish was available as well. The average student spent about 30 hours per week at school, exposed there only to Spanish.

In order to get a more objective measure of individual students' Spanish and English linguistic knowledge, the Peabody Picture Vocabulary Test (PPVT: Dunn and Dunn, 2007) and the Test de Vocabulario en Imágenes Peabody (TVIP: Dunn et al., 1986) receptive vocabulary test materials were purchased from Pearson Assessments, and these were administered electronically, following the main experimental task. Participants on average had stronger vocabulary in English than in Spanish (both tests' standard scores normed on 100), as indicated by the means and ranges reported in Table 4.3.

Measure	Standard score (mean)	Standard score (range)
PPVT (English)	106.3	71–130
TVIP (Spanish)	93.3	55–115

Figure 4.3: Bilingual participants' receptive vocabulary score data

The trend toward relatively high English proficiency can be seen clearly in Figure 4.4, which plots English vocabulary scores against Spanish ones. The fact that most data points fall above the dashed line (which has a slope of 1, indicating equal scores in each language) sug-

[6]The varieties of Spanish represented in the sample of teachers show different patterns of inversion/non-inversion for *some wh*-words; this issue is addressed in the Results and Discussion sections.

gests that participants' English was stronger than their Spanish—not a surprising outcome, given that they are being raised in the US.

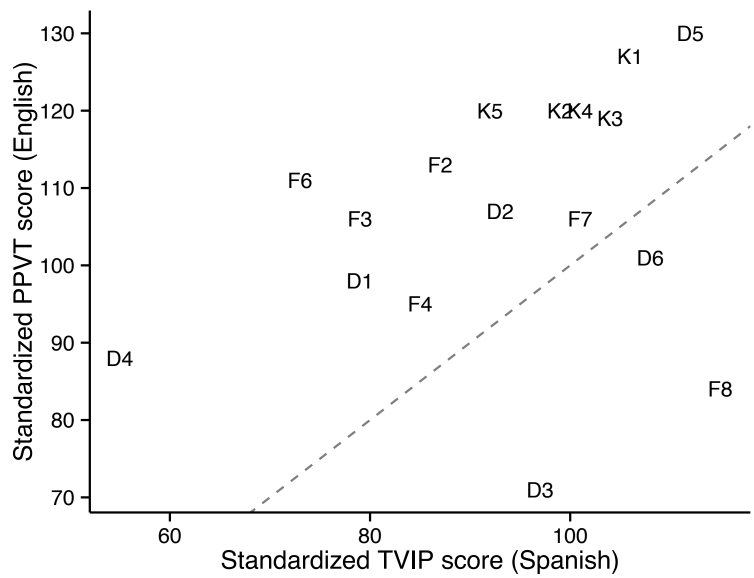


Figure 4.4: Participant vocabulary scores; dashed line indicates perfect language balance: $y = x$

Materials Drawing on successful *wh*-elicitation tasks from previous studies (e.g., Pozzan, 2011; Strik and Pérez-Leroux, 2011), I designed a picture-description task to elicit productions of *wh*-questions from children ages 3–5. Sixteen verbs, all transitive, were paired with 4 *wh*-words: *what* and *which*—argument *wh*-words—and *when* and *why*—adjunct *wh*-words. These 4 *wh*-words allow for comparison between *wh*-productions in argument as opposed to adjunct *wh*-questions (evidence has pointed to the former being earlier acquired than the latter, e.g., de Villiers, 1991), and are superior to other argument and adjunct *wh*-question alternatives because they are not susceptible to gross attachment ambiguities (like *where* often is) or conflicting theta-role typicalities (like *who* presents).

Verbs were selected for maximum familiarity based on CDI norms collected for children ages 16–30 months ($n = 1130$) (Dale and Fenson, 1996); the best-known 'action words' at 30 months that were transitive and allowed for an easily-depicted direct object were preferred (range of familiarity = 82.5% – 100% at 30 months). The following list of 16 verbs and direct objects were used:

(153)
a. eating (a watermelon)
b. hugging (her friend)
c. kissing (a tree)
d. opening (a present)
e. drinking (chocolate milk)
f. playing (a game)
g. washing (a striped t-shirt)
h. biting (a candy bar)
i. reading (a newspaper)
j. kicking (a football)
k. riding (a bicycle)
l. tickling (a kitty cat)
m. cleaning (a plate)
n. throwing (a baseball)
o. watching (a movie)
p. cooking (a pot of soup)

After randomizing these items (presented in (153) in descending order of familiarity according to the CDI), I developed two lists, such that if a verb was paired with an argument *wh*-word in List 1 it was paired with an adjunct *wh*-word in List 2, to go some way toward controlling for item effects by verb. Each list was pseudo-randomized to avoid having more than 2 consecutive items use the same *wh*-word, and no more than 3 consecutive items of the same syntactic type (argument vs. adjunct). As is typical of studies with children in this age range, no filler items were included.

Procedure

Participants were introduced to a character, Sarah, who "knows all sorts of things that will help us complete the game we're playing." The participant's task was to ask Sarah questions about what her friends, Nico and Buzzy, were doing (two characters were used in order to discourage self-priming of , e.g., "…is Nico…"). Visual aids were displayed on a computer screen to help children recall what they were to ask about, and pre-recorded responses from Sarah were played from the computer so that children could have the satisfaction of learning the answer to each question they asked. Further, the answers to the questions were designed to be somewhat silly and unpredictable, to encourage children to continue asking questions.

16 test items (4 per *wh*-word) followed 3 practice items. The practice items serve to help the child become accustomed to asking questions within the game context; these are past-tense subject-*wh*-questions, which require no inversion and no auxiliary and thus are presumably less demanding to produce than the target questions. The visual stimuli for both the practice and the target items have the format reproduced in Figure 4.5.

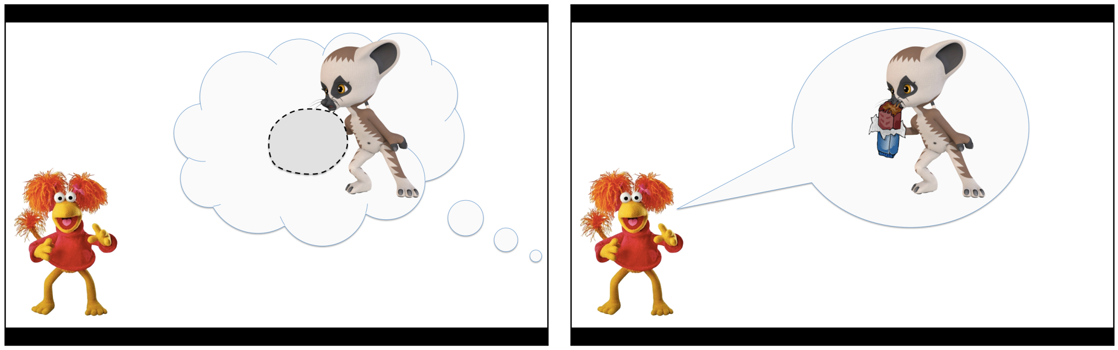


Figure 4.5: Left panel: Display, with hidden object, while experimenter gives prompt with verb 'biting'. Right panel: Display after child responds with question; contains sound file of 'Sarah's' answer.

Each trial began with a description by the experimenter of what needed to be found out next, having the form reproduced in (154).

(154) Nico is kicking something. *We* need to find out *what*. Sarah…?

The experimenter's prompts were printed on cards, which she handed to the child at the close of each trial for placing onto a game board that displayed a complete picture when all the cards had been read. This kept the child engaged, as the game was directed at a particular end, and also helped to keep stimulus materials orderly.

A single trial proceeded as in (155); finally, after all 16 responses were collected, participants completed the PPVT and the TVIP, in that order.

(155) (Experimenter) [takes card from stack, and reads:] Nico's kicking something. *We* need to find out *what*. Sarah…? (rising intonation, to encourage question)

(Participant) [directed to Sarah:] What is Nico kicking?

(Experimenter) [surreptitiously advances trial using remote]

(Sarah) A juice box!

(Experimenter) [hands card to participant]

(Participant) [places card face-down on game board]

(Experimenter) Good! Now Buzzy's…(and proceeds on to next trial)

Coding

All trials were videotaped; participant responses were transcribed by the experimenter. The transcribed responses were then coded for the errors observed in the corpora: omission of the auxiliary, failure to invert subject and auxiliary, omission of the subject, and other errors of inflection. Most responses that were not errors but did not display the target form, such as asking the wrong *wh*-question, asking a copular question (e.g., "What is it?"), or using the wrong aspect (e.g., using *do* and the simple lexical verb form instead of *is* and the progressive participle) were omitted from the analysis; as an exception, responses that only converted the tense of the auxiliary from present to past were preserved. The responses from one participant who did not complete the task were omitted; two participants who were unable for scheduling reasons to complete the separate and final task (TVIP, Spanish vocabulary) were included in analyses nonetheless.

4.2.2 Results

There was a great deal of variation in participants' responses, so the analysis of individual participant's performance is more illuminating than the group's as a whole. Nevertheless, after omitting the 21.7% ($n = 66$) of responses that were uninformative as to our hypotheses overall, 57.9% ($n = 176$ of a total of 304 trials) of responses were correct (156); 8.9%(n = 27) of responses contained inversion errors (157); 6.9% ($n = 21$) of responses contained auxiliary omissions (158); 3.0% ($n = 9$) of responses contained an omitted auxiliary *and* omitted aspectual marking on the lexical verb (i.e., were non-finite root forms: 160); 3.3% ($n = 10$) of responses contained a null subject (159); 1.3% ($n = 4$) of responses contained auxiliary doubling (161); 2.6% ($n = 8$) of responses contained doubled arguments (162); and one response contained the wrong subject case (163).[7]

(156) When is Buzzy riding a bicycle?

(157) *Why Nico is tickling a cat?

(158) *What Nico throwing?

(159) *Which bicycle's riding?

(160) *Why he read book?

(161) *What's he's washing?

(162) *What's he's eating a fruit?[8]

(163) Why is him kicking a football?

Figure 4.6 plots the percentage of each type of response that was given in the experiment, omitting the uninformative (i.e., non-*wh*-question) utterances.

[7] These percentages do not sum to 100, as some utterances contained more than one error type, and rather than diminish the number of errors found in the data, I chose to represent them as fully as possible by allowing duplicate representations in the analysis.

[8] This example displays a doubled auxiliary in addition to a doubled object argument. All double-argument productions had this trait.

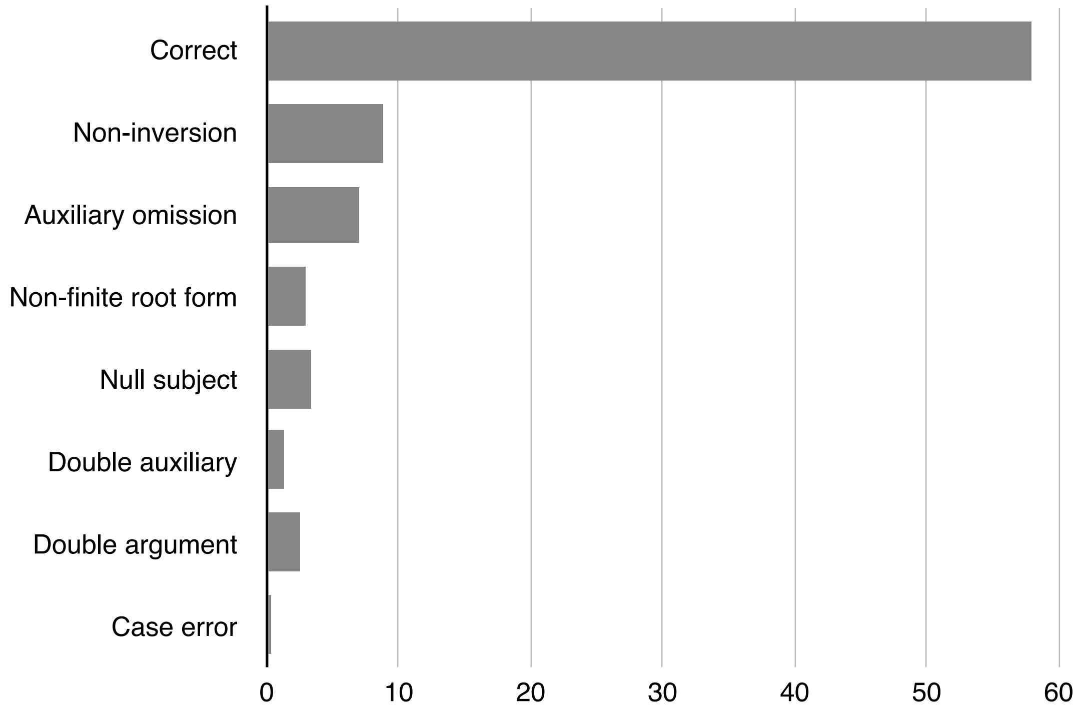


Figure 4.6: Percent of responses in *wh*-experiment by type

It is instructive to compare the present results with the findings of Pozzan (2011), who tested monolingual children equivalent in age, to see how the observed rates of response types compare. Given small task differences, which I address below, and the fact that the vocabulary data from the two studies cannot be directly related (so neither can proficiency), the comparison should be viewed with a degree of circumspection. Pozzan's monolingual participants produced, of a total of 264 questions, 4.7% without inversion ($n = 13$) and 4.2% with an omitted auxiliary ($n = 11$). Thus overall her results are in line with the bilingual participants in the present study. A chi-square test suggests that non-inversion rates do differ between the samples ($\chi^2 = 5.813$, $p < 0.02$), as do auxiliary omission rates ($\chi^2 = 3.899$, $p < 0.05$), if all participants' data are retained. The most compelling explanation for this unanticipated discrepancy (and in the unexpected direction) is that in Pozzan's task she did not present the auxiliaries in their contracted form, and therefore she may have primed their full form in her participants' speech. In addition, because of the larger sample in Pozzan's study ($n = 35$), it may be that her participants who did produce errors produced them at a similar rate to that of the participants in the present study, so that the overall number of correct responses was higher, decreasing the similarity of her sample to the present one.

The contribution of individual participants to the general pattern of results is emphasized by the fact that removing one clear outlier in auxiliary omission erases the difference between the bilingual sample and the monolingual one: without the participant who omitted 87.5% of his auxiliaries, a chi-square test comparing the samples is no longer significant ($\chi^2 = 0.504$, *n.s.*). I retain his data points in the charts below for completeness, but the reader should not interpret his data as anything more than an outlier.

Finally, it also may be the case that the English of Pozzan's participants *overall* was stronger—recall that by no means does the integration hypothesis predict that bilinguals will develop a language uniformly faster than monolinguals, and perhaps the participants in the present study had not had sufficient English exposure to experience the positive effects of Spanish input. There must in fact be *some* baseline level of English proficiency that is required in order for facilitation to be observed; no amount of Spanish exposure could facilitate the production of English wh-questions if a child has *zero* exposure to English. At some level of English proficiency, then, those scales should tip, allowing Spanish to support the development of English—and it must be some level meaningfully higher than zero.

Across individuals such a ‘tipping point’ most likely is reflected in a range of relative proficiencies, so while the relationship between error rates and relative language proficiencies is discussed below for the whole group, it does not diminish the effect that individuals’ exposure to each of their languages can have on their production patterns (i.e., on their tendency to exhibit signs of cross-linguistic influence).

Given the wide variety of English and Spanish proficiency evident in the sample (see Figure 4.4 above), it is more informative to look at individual differences in responses, and in particular the relationship of response patterns to those vocabulary levels.[9] Figure 4.7 shows the omission rate of auxiliaries in the experiment, where each point represents a single participant.

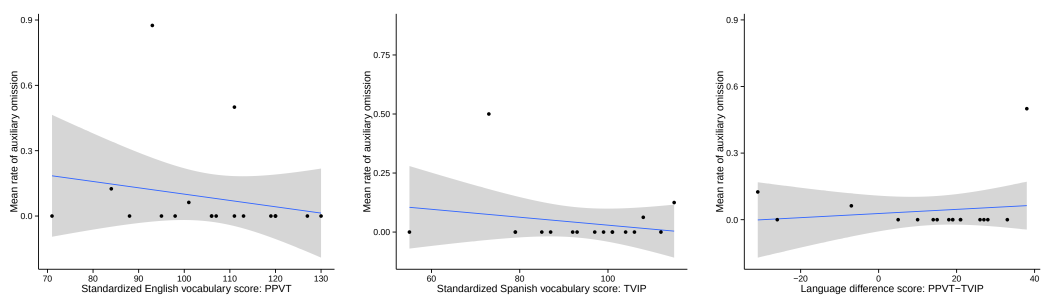


Figure 4.7: Rates of auxiliary omission related to vocabulary measures: PPVT (English), TVIP (Spanish), and difference

Only 4 of 19 retained participants omitted auxiliaries.[10] The clear outlier in the PPVT-related chart failed to include an auxiliary in 87.5% of his responses; he is one of the children who was unable to complete the TVIP, and was also the youngest participant. Another point represents a 50% failure to include an auxiliary, and perhaps curiously this same par-

[9] I interpret these vocabulary scores as a proxy for proficiency, although some researchers have taken issue with such interpretations (e.g., Paradis et al., 2013); nevertheless it is generally accepted that PPVT and TVIP as receptive vocabulary tests are acceptable measures of language development (cf. Bialystok, 1988, *inter alia*).

[10] Recall that the child omitted from the analyses declined to complete the task; the apparent outlying child is indeed included in this subset of 4.

ticipant failed to invert his questions 31.25% of the time. The remaining two points that represent a failure to include an auxiliary reflect one and two omissions respectively. Interestingly, there is no significant relationship between any of the vocabulary ratings and auxiliary omission, as computed using a series of logit mixed models with *auxiliary omission* as the dependent variable and any one or combination of the *vocabulary scores* as fixed effects.

Far more errors of non-inversion than of auxiliary omission were observed in this sample. As Figure 4.8 shows, more participants failed to invert than had omitted auxiliaries altogether, and these failures to invert seem to be related to language proficiency. Strong English is associated with fewer non-inverted responses; strong Spanish is associated with more non-inverted responses; and most importantly, having stronger Spanish than English is associated with more non-inverted responses (i.e., responses to the left of 0 in the rightmost, language-difference plot). A mixed logit model with *participant* as a random effect, *question type* as a fixed effect, and *non-inversion* rate as the outcome variable has a significantly improved fit when (any of) the vocabulary measures are incorporated: the Spanish scores are a better predictor than the English scores, and the language difference score is better than either language's score alone.

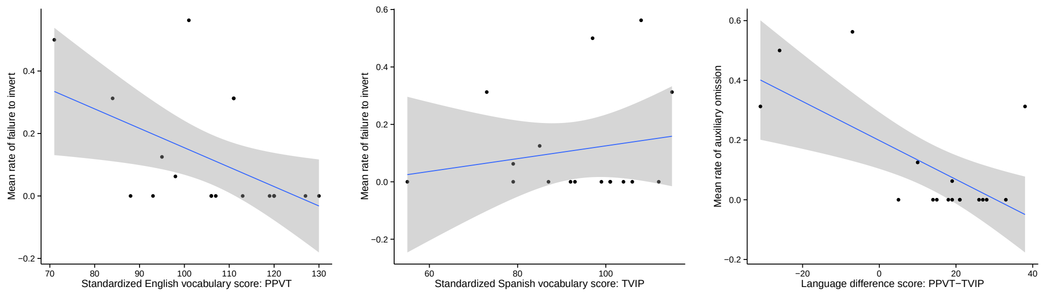


Figure 4.8: Rates of non-inversion related to vocabulary measures: PPVT (English), TVIP (Spanish), and difference

Seven of 19 participants produced at least one non-inversion error, and those who produced more non-inversion errors tended also to be those with weaker English (while the relationship to stronger Spanish was less pronounced). The inversion errors also plausibly owe to the *kind* of Spanish to which each individual has been exposed in the course of her acquisition of the language. The Spanish spoken by the teachers at the three testing sites reflects a range of dialects, including patterns 3 and 4 in Baković (1998)—dialects in which argument *wh*-phrases always invert but in which, in the case of pattern 3, manner (e.g., ‘how’), and reason (e.g., ‘why’) *wh*-words may not invert; and for pattern 4, reason *wh*-words may not. In other words, some children were exposed to dialects in which less ‘argumental’ *wh*-words did not trigger inversion, as is typical of Caribbean Spanishes: the teacher of the ‘F’ students ($n = 7$) hails from Puerto Rico, the teacher of the ‘K’ students ($n = 5$) from Chile, and the teacher of the ‘D’ students ($n = 7$) from Colombia. Puerto Rico is a clear representative of Caribbean Spanish and (northern) Colombian Spanish falls in this family as well (Brown and Rivas, 2011; Camacho, 2006), while Chilean Spanish has no relation to the Caribbean pattern (Camacho, 2006).

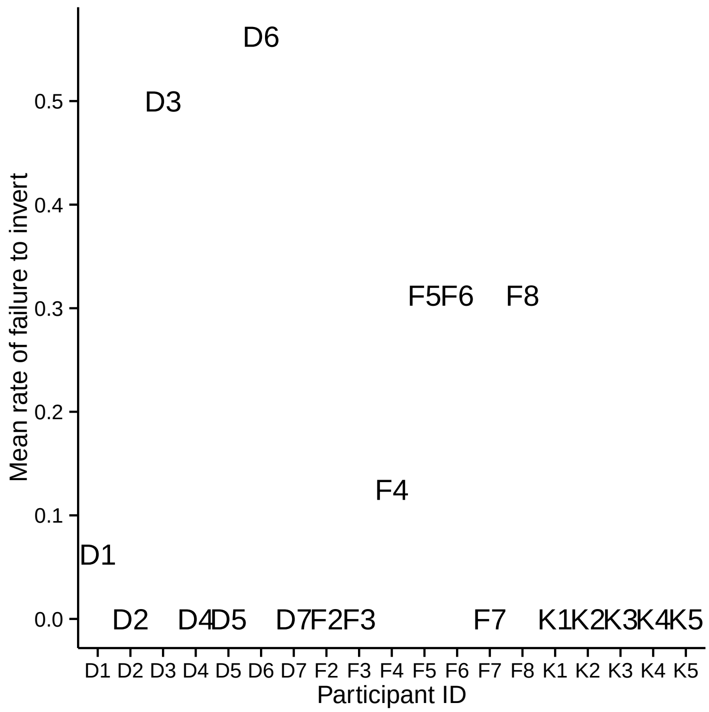


Figure 4.9: Mean rate of failure to invert subject and *wh*-word by participant

We have seen that, overall, Spanish-English bilingual children, who receive far less English exposure than their English monolingual peers, nevertheless produce very few errors involving auxiliary omission. We have also seen that the Spanish-English bilinguals who produce non-inversion errors in their *wh*-questions are precisely those who are exposed to varieties of Spanish that use non-inversion as the grammatical word order for adjunct questions. That some children are exposed to dialects of Spanish that invert argument *wh*-questions but not adjunct *wh*-questions predicts that there will be a difference between the participants' use of inversion across those two categories as well. Therefore the partial ranking in (114), which involves the floating of OpSp (otherwise not relevant to my omission analyses of the corpus data above), can be argued to take hold in some experimental participants' grammar. I do not claim here, however, that argument *wh-* regularities bleed into adjunct ones. Both were tested, and there was a marginal difference between non-inversion rates in argument and adjunct *wh*-questions. When the effect of question type (argument vs. adjunct) on non-inversion rates is analyzed with a mixed logit model, using the *language difference score* as a fixed effect and *participant* as a random effect; the addition of (argument vs. adjunct) *question type* improves the model fit significantly ($\chi^2(1) = 5.4142, p < 0.02$). This suggests that the participants who do fail to invert *in English* in fact reflect the dialect of *Spanish* to which they are exposed.

4.2.3 Discussion

In the elicited production task just presented, Spanish-English bilingual children omitted no more auxiliaries in English *wh*-questions than comparable monolinguals, in spite of reduced exposure to English. This result is thus another that supports the empirical generalization of facilitation in Spanish-English bilinguals' *wh*-question productions, which is predicted on the integration hypothesis argued for throughout the dissertation. In addition, some participants exposed to varieties of Spanish that divide the requirement of subject-verb inversion along the lines of argumenthood/adjuncthood of the *wh*-phrase produced a larger number of non-inversion errors than comparable monolinguals do *in English*, and they did so more often with adjunct questions than with argument questions, just as the Spanish dialect from which they have learned their Spanish does. While this finding is interfering rather than facilitatory, it is in line with the integration hypothesis nonetheless, as the root of children's English non-inversion errors can be traced to their Spanish grammar.

For the OT analysis of the facilitatory finding I refer the reader to Chapter 3, §3.5, but the interference evident in these data calls for a new presentation. As previously mentioned, some participants were exposed to a Caribbean variety of Spanish in which some *wh*-words require inversion and some do not. As we saw in the partial rankings that explain the optionality of inversion in monolingual English-speaking children's acquisition of questions (113), OpSp floats around $*F^2$ to produce either a full CP structure (when OpSp) outranks $*F^2$ or a TP-adjunction structure (when $*F^2$ outranks OpSp).

Until this point it has been adequate to our analyses to assume the interpretation of OpSp as a single constraint. But in reality, OpSp represents a *markedness subhierarchy*, a set of constraints that are more specific versions of the one general OpSp constraint. These more specific constraints are universally ranked relative to one another (the presently relevant hierarchy from Baković, 1998, with precedents in Prince and Smolensky, 2004 and Legendre et al., 1995). The hierarchy in (164) is ordered the same way across all languages; typological differences owe to the interleaving of Faithfulness constraints and other Markedness constraints that will either reveal or mask that there are subcategorical distinctions at work.

(164) ArgumentOpSp $\gg$ LocationOpSp $\gg$ MannerOpSp $\gg$ ReasonOpSp

In adult English and in the Spanish dialects that do not have, imprecisely speaking, an argument/adjunct distinction that corresponds to inversion patterns in *wh*-questions, other constraints *are not* interleaved within the hierarchy. Instead, the four constraints function as a monolith. Acquisition, however, could present a different pattern.

The regularity embodied in the hierarchy in (164) is compatible with several existing proposals on monolingual English-speaking children's acquisition of *wh*-questions as well. de Villiers (1991), Plunkett (1991), and Stromswold (1990) distinguish between children's abilities to move *wh*-words that are arguments and those that are adjuncts. The central premise common to these three analyses is that argument and adjunct *wh*-words have some different syntactic properties. Smallwood (1998) proposes that argument *wh*-phrases must be in SpecCP in order to properly govern their traces, which reside in some complement position farther down in the tree; adjunct *wh*-elements are not subject to the Theta Criterion and so do not require proper government of their traces, meaning in effect that they may be base-generated in a sentence-initial position. The combination of these two observations with the third point that spec-head agreement must be satisfied, always triggering auxiliary inversion, makes the prediction that fewer argument than adjunct *wh*-phrases will be found in children's speech *without* target-like auxiliary inversion. In some instances, this is indeed the case (e.g., the data in de Villiers, 1991), and in others, *wh*-word-specific non-inversion patterns are more prominent (Rowland and Pine, 2000). The data that Rowland and Pine (2000) believe contradict the conclusions of de Villiers (1991) and therefore the generativist proposal therein are actually supportive of a generative theory—the present version of OT, for example—so long as a fine enough grain of analysis is adopted. That is precisely what the markedness subhierarchy from Baković (1998) embodies, and it is natural to use it here with the bilingual children because clearly the fine grain of the argument/ adjunct distinction is at work in certain varieties of Spanish. And with the adoption of an integration hypothesis, the same distinction is ruled in as potentially affecting English.

For the OT analysis of the non-inversion errors produced in the experiment, I take as a point of departure the partial ranking presented in the previous chapter as (113), repeated here as (165), in which there is optionality between two *wh*-question structures: one, the adult target form, has a CP and the finite verb in C^0, and the other, a proposed structure for child non-inversion errors, adjoins the *wh*-word to TP and leaves the finite verb in T^0.

(165) *Floating constraints: inversion/non-inversion, (a) vs. (i) contrast*

Fixed: $*F^2 \gg *F$

Floating: OpSp ________

(166) a. OpSp $\gg *F^2 \gg *F$ yields: (a) $[_{CP}$ what does $[_{TP}$ subj t_{aux} $[_{VP}$ t_{subj} see $t_{wh}]]]$

b. $*F^2 \gg$ OpSp $\gg *F$ yields: (i) $[_{TP}$ what $[_{TP}$ subj does $[_{VP}$ t_{subj} see $t_{wh}]]]$

Rather than considering OpSp as a single constraint, however, we now split it into the four proposed in Baković (1998)—again, not because the pressures of bilingualism caused it to split, but because it has implicitly been shorthand for a markedness subhierarchy all along.[11] In this case, there are five different positions in which $*F^2$ can occur, each giving rise to a different typological option:[12]

(167) **$*F^2$** $\gg$ ArgumentOpSp $\gg$ LocationOpSp $\gg$ MannerOpSp $\gg$ ReasonOpSp

(168) ArgumentOpSp $\gg$ **$*F^2$** $\gg$ LocationOpSp $\gg$ MannerOpSp $\gg$ ReasonOpSp

(169) ArgumentOpSp $\gg$ LocationOpSp $\gg$ **$*F^2$** $\gg$ MannerOpSp $\gg$ ReasonOpSp

(170) ArgumentOpSp $\gg$ LocationOpSp $\gg$ MannerOpSp $\gg$ **$*F^2$** $\gg$ ReasonOpSp

(171) ArgumentOpSp $\gg$ LocationOpSp $\gg$ MannerOpSp $\gg$ ReasonOpSp $\gg$ **$*F^2$**

Both adult English and Iberian Spanish are represented by the ranking in (171), although it is possible that even some speakers of Iberian Spanish alternate (i.e., their constraints float)

[11] This entails that the whole hierarchy behaves as if it were a single constraint, being demoted (or being demoted around) as a unit.

[12] All of the rankings presented here correspond to attested varieties of Spanish (cf. Baković, 1998).

between (171) and (170), given the fluidity of the *por qué* 'why' word order, which passes between the two depending on the prosodic weight of the subject DP, discourse-contextual factors, priming, and other influences (cf. Goodall, 2011).

I model one participant's productions here as an example: participant F5 produced inverted *wh*-questions for all *wh*-words except for *why*, and did not produce any *wh*-questions with an omitted auxiliary. His grammar shows no signs of constraint floating, and in all likelihood the ranking within his grammar produces the target forms of the dialect from which he has learned (recall that the 'F' participants were those with a Puerto Rican teacher)—the dialect represented by (170). In order to converge on the ranking that will produce target *wh*-questions in *both* languages, ReasonOpSp must be altered in such a way that instantiations of it can flank $*F^2$. Acquiring the ability to produce target *wh*-questions in both languages requires demoting $*F^2$ far enough that any argument, manner, or location *wh*-operator can be hosted in a second functional projection (of just the sort that violates $*F^2$); English requires that $*F^2$ be demoted far enough that any reason operator can be hosted in a second functional projection as well.

Thus at the point in participant F5's development at which he took part in the experiment, he appears to have been using the ranking in (170), which is consistent with the Spanish to which he has been exposed. The outcome for English questions involving an argument *wh*-word is as in Tableau 4.2: the candidate (b) that does not have the argument *wh*-word in a specifier position is eliminated, while the winning candidate (a) violates $*F^2$.

eat(x, y), x=Buzzy, y=what, [+Q]	ArgOpSp	LocOpSp	ManOpSp	$*F^2$	ReasOpSp
☞ a. [$_{CP}$ what is [$_{TP}$ Buzzy t_{aux} [$_{VP}$ t_{subj} eating t_{wh}]]]				⊛	
b. [$_{TP}$ what [$_{TP}$ Buzzy is [$_{VP}$ t_{subj} eating t_{wh}]]]	*!				

Table 4.2: Ranking for participant F5: (object) argument question

In contrast, Tableau 4.3 shows that a *wh*-question with a reason *wh*-word—'why'—in an adjoined position (b) wins, because at least that candidate does not violate $*F^2$: it is more structurally economical.[13]

eat(x,y), x=Buzzy; z=why, [+Q]	ArgOpSp	LocOpSp	ManOpSp	$*F^2$	ReasOpSp
a. [$_{CP}$ why is [$_{TP}$ Buzzy t_{aux} [$_{VP}$ t_{subj} eating] t_{wh}]]				*!	
☞ b. [$_{TP}$ why [$_{TP}$ Buzzy is [$_{VP}$ t_{subj} eating] t_{wh}]]					⊛

Table 4.3: Ranking for participant F5: (reason) adjunct question

This ranking would be adequate if a child were acquiring (a certain variety of) Caribbean Spanish alone, but as is clear from Tableau 4.3, it is not capable of outputting all of the adult English target main question forms. As the child tries to match his English productions with those directed at him, he will continue to be unable to do so until he has demoted $*F^2$ below ReasOpSp—for English. But if that same constraint ends up ranked above $*F^2$, then the child's Spanish productions will not match those in his environment. Therefore, after a period of floating $*F^2$ around ReasOpSp, the latter constraint will split and be tagged for language: the English variant dominates $*F^2$, but the Spanish one is dominated

[13]It should be noted that phrase-level adjunction, of which the frontmost TP containing 'why', in Table 4.2's candidate (b), is an example, does not count as a separate projection, i.e. does not incur an additional *F violation. Instead, it may violate a lower-ranked constraint, e.g. *Adjunction (cf. Gutiérrez-Bravo, 2013).

by *F^2, giving rise to the desired contrasts. (I have removed the remaining OpSp constraints, as they are satisfied for all candidates in the tableaux below). Recall from Chapter 3, §3.5.1, that the procedure for assigning violations is first to check whether a constraint's *untagged* variant would be violated, then to check for a match in language tag, and finally to assign a violation if the tags do match.

eat(x), x=Buzzy; y=why, [+Q], lang=SP	ReasOpSp$_{EN}$	*F^2	ReasOpSp$_{SP}$
a. [$_{CP}$ por qué está [$_{TP}$ Buzzy t_{aux} [$_{VP}$ t_{subj} comiendo] t_{wh}]]		*!	
☞ b. [$_{TP}$ por qué' [$_{TP}$ Buzzy está' [$_{VP}$ t_{subj} comiendo] t_{wh}]]			⊛

Table 4.4: Target ranking for participant F5: Spanish candidate

eat(x), x=Buzzy; y=why, [+Q], lang=EN	ReasOpSp$_{EN}$	*F^2	ReasOpSp$_{SP}$
☞ a. [$_{CP}$ why$_{EN}$ is$_{EN}$ [$_{TP}$ Buzzy$_{EN}$ t_{aux} [$_{VP}$ t_{subj} eating$_{EN}$] t_{wh}]]		⊛	
b. [$_{TP}$ why$_{EN}$ [$_{TP}$ Buzzy$_{EN}$ is$_{EN}$ [$_{VP}$ t_{subj} eating$_{EN}$] t_{wh}]]	*!		

Table 4.5: Target ranking for participant F5: English candidate

Yet again we have seen that bilingual speakers produce utterances in one language that have parallels in the other—and that by splitting constraints in response to otherwise intractable problems of target-accurate evaluation it is possible to maintain the knowledge needed for two distinct languages within one single, parsimonious grammar. I now turn to a more challenging case of cross-linguistic interference, involving bilingual production contexts and various pressures on the grammar.

4.3 Experimental evidence for priming cross-linguistic interference in noun modification constructions

We have already seen evidence, both novel in this dissertation and previously available in the literature, of spontaneous and experimentally-elicited cross-linguistic structural interference, and explanations of this phenomenon have taken on a variety of forms, ranging from derivational complexity accounts (Strik and Pérez-Leroux, 2011) to cue competition between languages (Döpke, 1998). Still, most such accounts, and certainly accounts that do not tackle interference at all (e.g., Paradis and Genesee, 1996), maintain a categorical separation between the grammars of the two languages, attributing cross-linguistic influence to a temporary transfer of relatively specific grammatical knowledge, such as the setting of a single parameter (e.g., T-to-C movement in *wh*-questions), between otherwise distinct representational systems.

There are still more sources of evidence for the integration hypothesis to explore, however, including those presented in §4.1.3 on cross-linguistic structural priming. Hartsuiker et al. (2004) showed that tendency to reuse a recently experienced representation is present in bilingual adults between their two languages just as it is in monolinguals' single language. So just as in the monolingual Bock (1986) examples that were reproduced in the introduction (151–152), when a bilingual speaker of Spanish and English hears a passive in Spanish, she is likely to use a passive in the next production, *even if that next production is in English* (see also Loebell and Bock, 2003; Bernolet et al., 2007; Shin and Christianson, 2009). A small number of analogous results have been found with bilingual children as well (e.g., Vasilyeva et al., 2010), as mentioned previously. Because Hartsuiker et al.

(2004) found that participants' tendency to produce either an active or a passive sentence in Spanish—the target language—was dependent upon the construction in the previously heard English stimulus—in the source language—they proposed the 'integration' model of bilingual grammatical architecture that was presented in Chapter 1, in which structures that exist in both languages are represented only once and are shared across the two languages. Those representations are simply available for production and comprehension in each language, from within a single grammar, much in the way that my OT proposal locates two languages in a single grammar.

Existing research has shown cross-linguistic priming to arise when the grammatical properties of the structural pattern in the source language and the target language are closely aligned, in terms of function, word order, and other conceptual and surface-level characteristics. But the structural interference that we observe during bilingual development naturally suggests that constructions that only belong to one language might in fact be represented in a language-independent format. We take this suggestion to indicate the plausibility of the unorthodox hypothesis that all representations are shared between languages, and if this is correct, then constructions that belong in only one should nevertheless be available for use in the other. In contrast to traditional priming that operates between grammatical utterances, this would give rise to structural interference priming, from a grammatical utterance in the source language to an ungrammatical utterance in the target language. We therefore created a cross-linguistic structural interference priming paradigm that would allow us to test whether presenting an English utterance that had no identical corresponding construction in Spanish would cause interference to emerge in bilingual children's productions.

Because the integration hypothesis claims that the constraints involved in sentence production are shared between both of a bilingual's languages, we devised a scenario in which to elicit utterances that would possess characteristics of a construction used in only one language, by presenting an utterance containing that construction as a prime in the other language. The construction contrast we use is that of noun modification in Spanish and in English, drawing on Nicoladis (2006): in Spanish, the adjective must follow the noun (*la manzana roja*, 'the apple red'), whereas in English the adjective precedes the noun (*the red apple*). In order to distinguish between any potential effects of language context and construction prime, instances of noun modification in Spanish are elicited in three different contexts: a monolingual context with no prime, a bilingual context with no prime, and a bilingual context with a prime containing a structure which is grammatical in the source language but ungrammatical in the target language. We also investigate whether there is any role for language dominance to play in predicting susceptibility to interference priming, by exposing participants to receptive vocabulary tasks in each of their languages.

4.3.1 Method

Participants Twenty-four early sequential bilingual 4- and 5-year-old children, speakers of Spanish and English, participated in this study (mean age= 59.9 months, SD = 6.9). They were drawn from three bilingual immersion preschools, and informal discussions with teachers suggested that approximately 1/3 of participants spoke some Spanish in the home. No further data about language exposure was available.

Materials and procedure Four distinct tasks were run over the course of two days: the monolingual elicitation task; the bilingual elicitation/priming task; the Spanish receptive vocabulary measurement task and the English receptive vocabulary task.[14] On the first day, participants completed the monolingual elicitation task, the bilingual priming task, and the Spanish vocabulary measure, in that order; and on the second day, they completed the English vocabulary measure.[15] Each set of three tasks was completed in approximately 30 minutes, and one day passed between the first testing day and the second. Language production tasks were videotaped for later off-line coding; receptive vocabulary tasks were coded on-line. The author administered all tasks to all participants.

The study was designed to test participants' knowledge and use of noun modification in Spanish with the novel interference-priming paradigm. Noun modification was chosen because it would be sufficiently familiar to participants and because it could be elicited using pictures, as priming via reading is not an option for children of this age. Noun modification in English is deterministic; the adjective almost always precedes the noun (*the red apple*, cf. **the apple red*), although some constructions can give the appearance of post-nominal adjectives (e.g., resultatives: paint the town red; reduced relatives: something red). Spanish noun modification is more flexible, and adjectives can appear pre- or post-nominally, depending on the context in which the construction is used. The pre-nominal position is reserved for epistemically motivated modification and cannot be used for adjectives which serve to restrict the set of objects to which the noun can refer; the post-

[14]The study was run over two days not because of the existence of these tasks but because of a supplementary one, related to cognitive control, the results of which were inconclusive and are not germane to the goals of the dissertation.

[15]On this second day two additional tasks were run, one a re-run of the priming task and the other either a cognitive control training task or a visuospatial working memory task.

nominal position is the default, and is required when the adjective is used contrastively (Demonte, 1999). As will become clear in the presentation of the tasks, the conversational context was designed so as to restrict the *grammatical* position of the Spanish adjective to the post-nominal one (the adjective is used to distinguish the stimulus from the target). As such, it is not possible to distinguish between participants' default use of a post-nominal adjective in Spanish and their target use (compelled by the discourse context). However, the underlying grammatical representation of the two is the same, and this ambiguity is irrelevant to the interpretation of the results.

Cross-linguistic interference priming

A novel bilingual picture-description task was developed to motivate a bilingual discourse context. The experimenter spoke English (and thus delivered the stimulus primes), and the participant responded in Spanish. Participants learned a rule for selecting which picture to describe, and they were likely to believe that following this rule effectively was the goal of the task. This probably distracted from the linguistic focus of the task and allowed participants not to reflect on their sentences before uttering them, which provides us with a relatively clear picture of their production processes and abilities.

The cross-linguistic priming task contained 24 target images and 24 distracter images in the testing phase, and 3 additional pairs of images in the training phase. These were scaled to the size of approximately 9 sq. in. each and embedded in computerized slides. Each slide contained two images, one from the target set and one from the distracter set, that were matched on the dimension of the relevant modifier (e.g., red apple and red strawberry). Although any image has an indeterminate number of potential descriptions, the prime sentence made salient what dimension the child was to attend to, as in (172).

(172) It was a green apple.

This sentence mentions the color of the object as the relevant dimension. The subject was then presented with a slide as shown in Figure 4.10, such that although she could have described the target object as 'whole', 'sweet', 'ripe', etc., subjects named the color dimension in their response. Twenty-four prime sentences were constructed containing diverse objects familiar to children and which varied along dimensions which were visually salient and also familiar to children. A complete list of these objects and modifiers is shown in Appendix A.

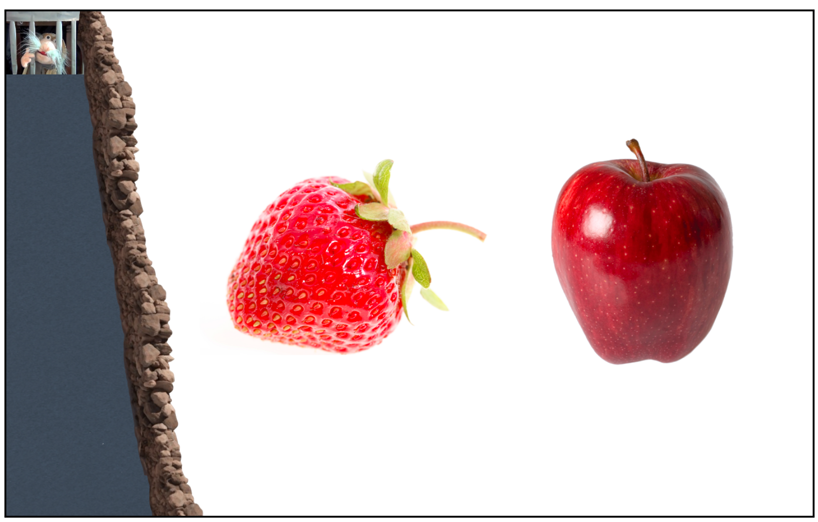


Figure 4.10: Sample visual stimulus from priming task

In addition to these visual stimuli, a series of brief videos were created for the purpose of motivating the child to speak Spanish while the experimenter spoke English. These videos contained a puppet character who spoke only Spanish, such that in order to communicate with him the child needed to speak Spanish. These videos were recorded on a Sony digital camera by the experimenter and presented within the Keynote presentation. The puppet character, visible in the upper-left corner of Figure 2, reappeared in each slide to elicit a direct response from the child, asking in Spanish for the subject's recommendation. The character moved about the left side of the screen, giving subjects a sense of accomplishment. This task was presented on a MacBook Air with a 13″ screen, which was placed approximately 24″ away from the child during testing.

The priming task consisted of an object-description game, in which the experimenter and the subject were seated beside one another and in front of a computer screen on which pictures to be described were displayed. The task began with a script that motivated the child to speak Spanish despite the fact that the experimenter would speak English throughout the task. Interacting with the puppet trapped inside the computer, the experimenter spoke with the puppet in Spanish and then introduced the puppet to the participant. An animated video played as the puppet's voice-over described, in Spanish, what had happened to get him stuck inside of the computer; he had tried to bribe a mean queen to let him go by giving her a variety of gifts, but she didn't like any one of them, so she trapped him anyway. After this story, the experimenter reviewed three important details from the video and animation: one, the puppet was a monolingual Spanish-speaker and would not understand English; two, the puppet had no way of seeing out of the computer nor over a wall, so the participant would need to describe to him exactly what he should try to give the queen the next time; and three, if the participant helped the puppet give all the right gifts to the queen, she would free him, and the participant would get to play with him. At the close of this interaction, the subject expected the experimenter to teach her how to select the object that she should name for the puppet. This instruction was given in English using at least one and at most three training items.

(173) “The first thing that Pablo tried to give the queen was a bee, and it was angry. She didn’t like it. So here are two more things he can give her. This one is a monkey, and it’s happy. This one’s a bee, and it’s happy. Now, the monkey is too different—the queen wouldn’t like that—but the bee is just a little a bit different, and that’s the thing that you should tell Pablo to give the queen. Can you tell him what to give her?”

The experimenter then advanced the program to the next slide, which caused the computer to play the brief Spanish prompt video in which the puppet character solicited a response from the subject. If the subject responded with any string that contained the Spanish words for ‘bee’ and ‘happy’, positive feedback was given and the next item was begun. This was done regardless of whether the response was grammatical and also regardless of whether the response contained a simple DP string (with some order of A and N contained) as opposed to a relative clause or predicative construction. If the subject did respond in Spanish but used only N, she was reminded that the puppet had already given the queen that N, and that he needed to know exactly what to try to give her this time or he might give her the wrong one again. If the subject responded in English, the fact that the puppet did not understand English was reiterated. Such promptings were repeated until the subject gave a target response as indicated just above. Two more ‘practice’ items were then administered to ensure that the subject had mastered the object- selection rule, and then the experimenter moved into the testing phase, without marking that a practice phase had ended.

Following the practice phase, two blocks of trials were presented: the first block contained the auditory stimuli that were intended not to prime either order of A and N in the subject's productions; the second block contained the auditory stimuli that could prime A-N ordering in their Spanish productions. Items were ordered such that no more than two sequential trials contained a modifier of the same type (i.e., color, size, aspect). Sample auditory stimuli are shown in (4).

(174) "Then Pablo gave the queen something else she didn't like…"

a. *(**Block 1:** neutral prime block, predicative construction)*

"...That apple was green."

b. *(**Block 2**: interference prime block, adjective-noun construction)*

"...It was a green apple."

Just as in the practice trials, the experimenter's verbal prompt was followed by a brief Spanish prompt video containing the puppet's solicitation of a suggestion, and the subject responded in Spanish. If the subject did not know the name of the target object or target modifier in Spanish, this lexical item was provided to her by the experimenter. If upon receiving this lexical item the subject began her utterance again—that is, uttered an adjective and a noun—the experimenter proceeded to the next item; if the subject instead only repeated the newly presented word, the experimenter asked the subject to say the whole thing for the puppet. Once a string containing the relevant lexical items was uttered, the next trial would begin.

After all 24 trials were completed, the puppet was 'freed' and briefly engaged the subject in conversation in Spanish. The puppet then announced that he was tired and wanted to take a nap while the experimenter and the subject played one more game.

Monolingual elicitation

An elicitation task modeled after Nicoladis (2006) aimed to partially replicate her work with French-English bilingual children as well as to establish a baseline of ungrammatical adjective-noun productions in our participant pool. Our version of this task was created out of clip-art images. These images depicted common objects distributed in an array such that all the objects on the periphery were identical to one another, while the center object differed on a perceptually salient dimension (see Figure 3).

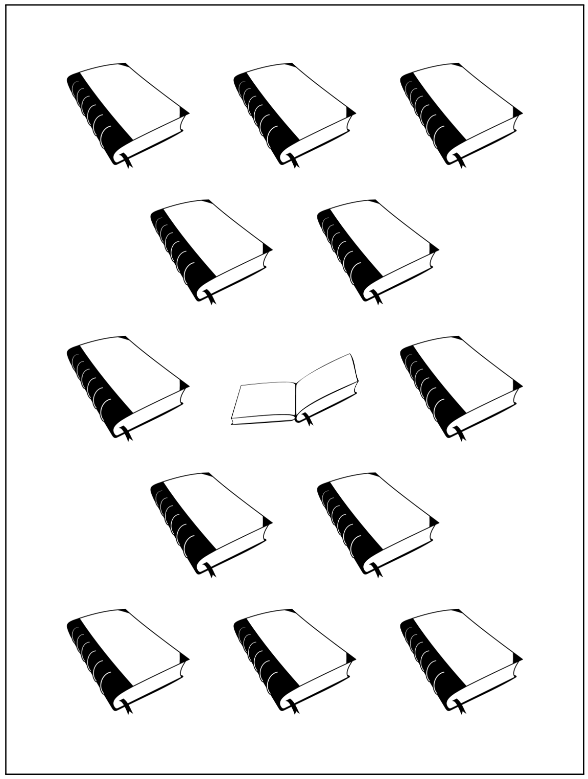


Figure 4.11: Sample visual stimulus from (Spanish monolingual) elicitation task

Twenty such arrays were created with corresponding Spanish verbal stimuli and were printed on letter paper and inserted into a binder in transparent sheet protectors. In the case of the array in Figure 4.11, the verbal stimulus is shown in 175.

(175) *Todos estos libros están cerrados.* 'all these books are closed'

All of the verbal stimuli for the elicitation task can be found in Appendix B. It should be noted that *estar* 'to be' was used with all items, in spite of the fact that some modifiers could be considered individual-level predicates and others state-level predicates. The decision was made to use this copula (rather than the obligatorily individual-level copula *ser*) in order to maximize the likelihood that participants would accept the reading coerced by the verb, given important dialectal differences regarding the generality of *estar* use (cf. L 'opez-González, 2010).

The elicitation task was administered similarly to Nicoladis (2006). The experimenter spoke only Spanish to the participant, explaining that she was going to show the participant a series of pages that had lots of pictures on them. The experimenter also observed that the object in the middle was different from the objects on the outer edges of the page (recall Figure 4.11). It was then explained that the experimenter would tell the participant what she saw on the outer edges of the page and that, following this, they would turn back to the beginning of the binder and the experimenter would ask the child to tell her what was in the middle. In the first pass through the pages, the experimenter pointed to several of the outer images and said, *Todos estos N están A* 'All these N are A', where N is the relevant noun and A the relevant adjective.

After all twenty pages had been viewed and the outer images described, the experimenter pointed to the target object in the center and asked, *Dime, ¿qué es esto?* 'Tell me, what is this?'; if the child responded with an utterance containing an adjective and a noun that could plausibly describe that image, the experimenter moved on to the next item. If the participant's first response contained only an adjective, the experimenter prompted, *¿Y qué es?* 'And what is it?'; if the participant's first response contained only a noun, the experimenter prompted, *Pero todos son N; ¿qué es esta cosa aquí?* 'But all these are N; what is this thing here?'. If the participant provided a response containing an adjective and a noun at this point, the experimenter would move on to the next item. Often, however, if the participant had given only the adjective or only the noun on her first response, she would give the other constituent on her second response. Therefore, a third prompt could be administered (*Pero dime por favor, ¿qué es esto exactamente?* 'But tell me please, what exactly is this thing?') while the experimenter again pointed to the target object. Regardless of the participant's response to this prompt, the experimenter moved on to the subsequent item.

In addition to the use of these protocols, a decision was made not to supply the participant with the lexical item when she indicated that she did not know the word for the target item so as not to contaminate the task with any English. Therefore, if after the first prompt (Tell me, what is this?) the participant did not respond, the first-pass prompt was repeated (All these N are A) to remind the participant of the name of the noun. No hint was given as to the lexical identity of the modifier. If the participant continued to indicate that she could not give a response, the experimenter moved to the next item.

Receptive vocabulary

Receptive vocabulary tasks are an appropriate measure of linguistic development in the early sequential bilingual population, more so than other popular tests such as the MacArthur-Bates Communicative Development Inventory (MCDI: Fenson et al., 1993), the often-used questionnaire aimed at parents. Because our participants received most of their Spanish exposure in school, parents could not be relied upon to assess their children's lexical development in Spanish as would be required by the Spanish MCDI. Thus we used standardized receptive vocabulary assessments and tested the children directly.

The Peabody Picture Vocabulary Test (PPVT: Dunn et al., 2007) and the Test de Vocabulario en Imágenes Peabody (TVIP: Dunn et al., 1986) materials were administered according to the instruction manuals which accompanied those test kits.

4.3.2 Data analysis

Coding of all data was carried out by the experimenter using the recorded videos for the language and cognitive function tasks and on-line for the vocabulary tasks. Vocabulary tests were computed according to standard procedures: using the measures provided by the makers of the tests, raw scores were converted to standard scores, which scale the raw score by the age of the participant. Data from the elicitation task and the priming task were transcribed and then coded for word order, according to the categories (1) adjective-noun, (2) noun-adjective, (3) relative clause, (4) predicative construction, and (5) other. Where participants requested and were given a lexical item in Spanish during the priming task, this was recorded as well (no such requests were granted during the elicitation task). Upon a first-pass analysis, no effect of the provision of lexical item in Spanish was observed for the priming task, thus in all analyses I include items for which participants requested a vocabulary item in addition to those which participants produced spontaneously. This facilitates the comparison between subjects' performance, as it creates consistency in the number of items per subject.

Were participants primed by adjective-noun utterances in English to produce adjective-noun in Spanish? To answer this question, comparisons between participants' performance on the monolingual elicitation task and their performance in both blocks of the priming task will be presented. This enables us to see whether it is the influence of English alone or instead of the structure I prime that causes the production of adjective-noun strings. I have also tested for correlations between performance on each of these tasks and language dominance, because it could be the case that English-dominance contributes to a greater incidence of English-like structures in production.

Results

Cross-linguistic inteference priming Table 3 shows the mean percentages of three possible DP types, adjective-noun, noun-adjective, and relative clause, produced by participants in the elicitation task and in the priming task.

Task	Adjective-noun	Noun-adjective	Relative clause	Other
Elicitation	3.75% (1.2)	31.4% (6.7)	28.1% (6.8)	36.7% (6.1)
Neutral block	17.4% (5.7)	57.3% (7.7)	16.0% (5.7)	9.4% (3.9)
Interference block	32.6% (6.8)	45.8% (7.1)	14.6% (5.3)	6.9% (4.0)

Table 4.6: Mean percentages (standard errors in parentheses) of adjective-noun, noun-adjective, relative clause, and 'other' utterances across three production tasks on Day 1 for total sample (n=24)

Participants rarely produced instances of spontaneous cross-linguistic interference, as evidenced by the mean percentage of adjective-noun utterances in the elicitation task, which provided a neutral Spanish context. This suggests that participants have target-like knowledge of Spanish noun modification.

Looking at (monolingual) the elicitation data in more detail, out of 20 trials, participants produced an average of 14.1 Spanish-only tokens containing a target adjective and a target noun (SD = 5.6). Of these, the mean number of determiner phrases produced per participant was 11.8 (SD = 6.3), while the remaining utterances were predicative descriptions of the target item (i.e., *Este perro está rojo* 'This dog is red'). The proportion of DPs containing a nouN-Adjective string was not significantly different from that of DPs containing a relative clause (paired $t(23) < 1, n.s.$). These, in addition to predicative item descriptions, accounted for the majority of responses. The pragmatics of the task may have contributed to the high proportion of relative clause productions; visual reference to the objects slated for comparison drew special attention to the difference between the two modifiers, rather than simply requiring a description of the central object. Caution should also be preserved in interpreting the results of this task due to the large percentage of 'other' responses, which for the elicitation task are attributable to a variety of divergences from the target (use of a preposition phrase modifier, use of English, failure to produce both adjective and noun). Still, most participants (n=16) never produced an adjective-noun string in this task. Thus the elicitation task results show a clear pattern and so establish an acceptable baseline against which to compare the priming task results.

Upon entering into a bilingual language context, participants produced more adjective-noun utterances overall than they had in the monolingual Spanish context (bilingual context: 144/541(26.6%); monolingual context: 18/284 (6.3%), where the denominator represents the sum of all responses containing an adjective and a noun). A pairwise comparison of the proportion of adjective-noun utterances produced in each of these two tasks yields a significant difference between the tasks, with more adjective-noun utterances being produced in the priming task (elicitation: $M = 3.8\%$ ($SE = 1.3$); priming: $M = 25.0\%$ ($SE = 5.9$); paired $t(23) = 3.489, p < 0.01$). This suggests that participants' response patterns are influenced by the change in task, however there are several ways in which this can be interpreted, as will be addressed in the discussion.

The patterns of responses found in the two blocks in the priming task differed from the elicitation task and from one another. Participants produced significantly more adjective-noun utterances in the priming task (collapsing over both blocks) than in the elicitation task (paired $t(23) = 2.356, p < 0.05$). Critically, the percentage of adjective-noun utterances increased from the neutral priming block to the interference priming block (neutral block: $M = 17.4\%, SE = 5.7$; interfering block: $M = 32.6\%, SE = 6.8$; paired $t(23) = 3.434, p = 0 < 01$). This indicates that presenting an adjective-noun string in English makes Spanish-English bilingual children more likely to use that string in Spanish, even though that order is ungrammatical. The result is precisely what was predicted on the integration hypothesis.

There is another way of analyzing the elicitation data, which calls for the exclusion of all the utterances which did not contain a noun and an adjective and the computation of proportions using those totals. This version of the analysis erases the difference between the elicitation task and the first block of the priming task (for the full sample of 24 participants and counting only DPs, elicitation mean = 11.4% adjective-noun utterances ($SE = 4.7$); priming task neutral block mean = 18.5% adjective-noun ($SE = 5.9$); paired $t(23) = 1.030; p > 0.3$). The difficulty with adopting this analysis is that it attributes different response patterns to participants who might have been basically the same on the dimension of interest: for example, a participant who produced 2 adjective-noun utterances, 8 relative clause utterances, and 7 predicative utterances, would receive a score of 20% for her adjective-noun performance, while another participant producing 2 adjective-noun utterances, 2 nouN-Adjective utterances, and 15 predicative utterances would receive a score of 50%, suggesting that her Spanish might be far more English-like than the first participant. Yet each child's adjective-noun use was numerically the same. All I can address is what participants did produce, and so I adopt the more conservative analysis that reflects item frequencies more accurately. This analysis reveals a difference between the elicitation task and the neutral prime block.

Participants' response patterns in the priming task were examined individually because 16 of our 24 participants did not produce cross-linguistic syntactic interference in the monolingual elicitation task. It was determined that 5 of these participants never produced an adjective-noun string (during the elicitation task as well as both days' priming tasks). These participants always used a grammatical variant of Spanish noun modification (i.e., nouN-Adjective, relative clause, or predicative utterance). No other factor (i.e., age, vocabulary score) distinguishes these subjects as a group. I discarded those participants from subsequent analyses regarding our first research question: if at no point does a participant produce an instance of cross-linguistic interference, it is reasonable to assume that her grammar and performance mechanism are adult-like, at least with respect to this construction. Just as discussed in the introduction, adults under normal performance circumstances are not expected to be susceptible to cross-linguistic syntactic interference priming, and therefore, I exclude our 'adult' participants in order to capture children's behaviors as cleanly as possible. Table 4 contains the descriptive statistics for this limited sample; Figure 4.12 illustrates them graphically for ease of visualization.

Task	**Adjective-noun**	**NouN-Adjective**	**Relative clause**	**Other**
Elicitation	4.7% (1.5)	38.9% (7.7)	23.4% (6.9)	32.9% (5.8)
Neutral block	21.9% (6.9)	62.3% (8.5)	10.1% (4.8)	5.7% (1.8)
Interference block	41.2% (7.4)	45.2% (7.7)	9.4% (4.4)	3.9% (2.0)

Table 4.7: Mean percentages (standard errors in parentheses) of adjective-noun, nouN-Adjective, relative clause, and 'other' utterances across three production tasks on Day 1 for reduced sample (n = 19)

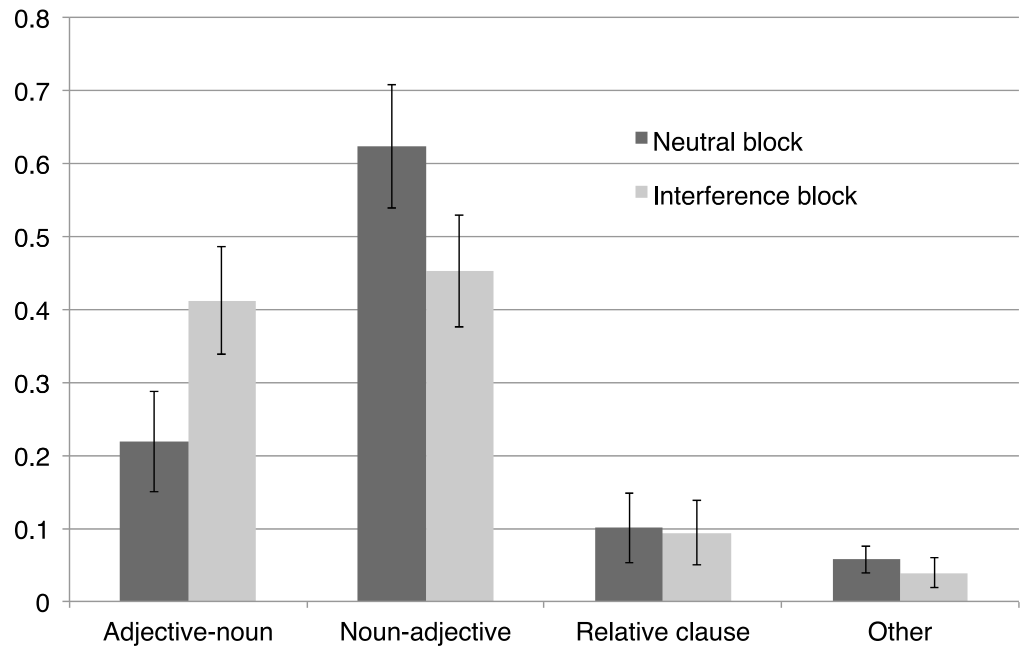


Figure 4.12: Mean response types presented by task. Y-axis values are proportions.

The pattern after excluding the 5 ceiling subjects is no different from that already reported. The percentage of adjective-noun utterances rose significantly, just as with the previous sample, from the neutral block to the interference block of the priming task (paired $t(18) = 3.671, p < 0.001$). This sample is representative of the pattern that had been predicted: participants' tendency to produce adjective-noun utterances in their responses increased during the interference priming block.

Language development as represented by vocabulary scores may have influenced participants' response patterns across the tasks. Participants' vocabulary scores averaged a mean PPVT (English) standardized score of 108.9 ($SD = 16.5$) and a mean TVIP (Spanish) standardized score of 95.3 ($SD = 12.8$), where a score of 100 is the normed population mean (recall that standardized scores were computed from raw scores which are indexed by age to the population distribution). These significantly differ from one another by individuals (paired $t(18) = 2.749, p < 0.02$). The English scores are higher, suggesting that the overall sample skews English-dominant. The absolute value of the difference between these two scores for each individual ranged from 1 to 41 (where 1 signifies a virtually balanced bilingual and 41 signifies moderate language-dominance).

The relationship between the vocabulary scores and the language production tasks is as follows. The proportion of adjective-noun utterances participants produced in the elicitation task was marginally positively correlated with English-language dominance (Pearson's $r = 0.359, p = 0.065$). The proportion of adjective-noun productions in the neutral block of the bilingual priming task correlated positively with English-language dominance (Pearson's $r = 0.516, p < 0.02$). The proportion of adjective-noun productions in the interference block of that task did not correlate with English-language dominance (Pearson's $r = 0.242, p > 0.15$). Therefore while dominance predicts adjective-noun productions to some degree, the explanation for the priming of these utterances lies elsewhere. Also important is the fact that the difference between individuals' productions of adjective-noun responses in the neutral block compared with the interference block (number of adj-n in interference block minus number of adj-n in neutral block) did not correlate with English-language dominance (Pearson's $r = -0.239, p > 0.25$). This suggests that the effect that the priming manipulation had on individual subjects as a function of their baseline performance in the neutral block cannot be attributed to greater English proficiency.

These results establish that the Spanish-English bilingual children tested used target nouN-Adjective or relative clause constructions in a monolingual Spanish context. But when children entered into a bilingual context, a tendency to use English-like adjective-noun structures in Spanish utterances emerged. Critically, when participants were exposed to adjective-noun constructions in English, their tendency to use that structure in their own Spanish utterances increased. This set of findings confirms the prediction made by the integration hypothesis of bilingual grammar and, as will be discussed in the next section, is incompatible with the isolation hypothesis.

4.3.3 Discussion

The present study asked whether it was possible to prime the production of cross-linguistic interference in bilingual speakers. The answer to this question was affirmative: the incidence of adjective-noun productions in participants' Spanish responses significantly increased when they were exposed to adjective-noun primes in English.

The successful use of a cross-linguistic interference priming paradigm to elicit the production of adjective-noun utterances in participants' Spanish confirms yet another prediction of the integration hypothesis, namely that abstract grammatical knowledge that may have been developed in response to primary linguistic data from one language may be recruited for productions in the other—even if that recruitment leads to non-target utterances. Adjective-noun constructions were elicited in Spanish after participants heard an English sentence containing that construction. This frequency increase occurred in spite of the fact, as I have also shown, that participants' default Spanish productions are grammatical ones, either containing the correct, nouN-Adjective order or correct relative clauses.

It is not merely the case that the integration hypothesis receives support from these results. Instead the finding is *incompatible* with the isolation hypothesis, at least under any existing formulation of it. Priming cannot obtain without some shared abstract structure between prime and target, and this is as true of cross-linguistic interference priming as it is of grammatical cross-linguistic priming as well as monolingual structural priming. Specifically, without the shared structure there would be no basis for the observed boost in adjective-noun productions in the interference block: if adjective-noun were to emerge, it should have done so equally in all three production contexts (elicitation, neutral prime, interference prime), as simply another (non-target) option provided by the grammar. But since we have observed not only cross-linguistic interference but *priming* of the same, it is not merely incomplete knowledge, or transfer, or errors that underlie the bilingual children's adj-N productions in Spanish—they are an option available in *the* grammar, and the communicative and cognitive forces of the experiment influenced their emergence.

Before turning to a sketch of the priming results in Optimality-Theoretic terms—and the several architectural/mechanical issues it raises—I grapple with a few outstanding issues that should be kept in mind as I supply my interpretations.

Outstanding issues

Several issues surrounding these results and their interpretation remain outstanding. I have claimed that the reason for participants' increased use of adjective-noun in the interference block of the priming task is that activation of the Adj-N node initiated by the source language persists into the target response. An alternative interpretation for this phenomenon lies in an accumulation of English input, such that the more English a participant hears, the likelier she becomes on any one trial to use an English-derived structure. In order to investigate this alternative hypothesis, I divided the two blocks of 12 items into sub-blocks of 6 items each to determine whether participants were more likely to produce adjective-noun during the second half of the block than during the first. In total, participants produced virtually identical numbers of adjective-noun utterances in each half of the blocks (first half of neutral block, 24 total adjective-noun utterances; second half of neutral block, 27 total; first half of interference block, 46 total; second half of interference block, 48 total). It does not appear then that accumulation of English could fully explain our interference effect, because participants were just as likely to produce English-related utterances in Spanish during the beginning of a given block as they were toward its end.

In any case, finding that accumulation of English input led to a greater incidence of English-like structures in speakers' Spanish productions would not pose a problem for the integration model *of processing* as construed by Hartsuiker *et al.* (2004: see Ch. 1, Fig. 1.1 on p. 22), so long as the effect of the interference priming condition could be dissociated from the language-accumulation effect. That version of the general hypothesis defended here does not rule out the build-up of activation during comprehension, which could originate at a language node (e.g., SPANISH) and percolate down to lemmas (e.g., *car*) and constructions (e.g., *It was a blue car.*). Such spreading of activation is in fact a natural consequence of an interconnected processing model of the Hartsuiker *et al.* type, but the question then arises of what the relationship is between that language-level activation and residual construction-level activation. Some of our data may shed light on this relationship. Certainly our results currently suggest that it is the priming of the adjective-noun construction in the English stimulus that causes the production of that same order to increase in the Spanish target production. Yet leaving aside for a moment this priming effect, we can also consider the increased proportion of adjective-noun utterances in the neutral prime block of the bilingual priming task, relative to the elicitation task results.

The elicitation task results should be interpreted with caution, since we cannot say whether or not under ideal conditions all of our participants' 'other' responses would have had the nouN-Adjective form, the adjective-noun form, or something else. It is still worthwhile, however, to try to understand the data that are available. The difference between the monolingual elicitation results and the bilingual neutral prime block results can be accommodated by the Hartsuiker *et al.* processing model because a language is represented as its own node, rather than being simply an operationalization of 'the collection of grammatical rules and lexical items used in one system', as it appears to be on the isolation hypothesis (e.g., Hulk and Müller, 2000). Such would be the account of isolation because a separate *language* representation is redundant in a system where the defining characteristics of each language are already compartmentalized. In the integration model, on the other hand, it would seem that English itself, rather than any particular construction, is being activated—its likelihood of being used in production increasing—during each auditory stimulus presentation in the neutral block of the elicitation task. This fits with the 'alignment' account of priming proposed by Pickering and Branigan (1998), where potentially even general procedures for processing come to be shared between two interlocutors. One possible explanation for how alignment of this type happens is as follows: each time a participant detects an utterance in English, the 'English' node of her processor receives activation, which spreads to all English-language lemmas and then to all their related constructions. The difficulty with an explanation of this sort is that what it means to activate English has not been specified: what does the activating? Perhaps it is phonology, but it could also be the purposeful switch to English by the listener, or the result of perceiving a word whose lemma is associated with only one language. The mechanisms of language-related activation would call for a more precise formulation before they could be used in interpreting our results. Rather than try to adopt this type of model, however, I will explore the facts just discussed in the OT model that has been developed in the course of the dissertation and venture some modifications to the system that partly take their inspiration from just this sort of interconnected picture.

Before turning to my OT account of the cross-linguistic interference priming results, it bears mentioning that the English-dominance displayed by this subject pool was most likely a function of the fact that a majority of these children speak only English at home. Most participants have learned Spanish in school, and despite being in an immersion setting, this exposure appears not to be sufficient to offset the effect of having spent the first approximately two years of their lives as monolingual speakers of English. While even the most stringent standards do not insist upon drawing a distinction between these participants and simultaneous bilinguals regarding language development (cf. Unsworth and Blom, 2010), they perhaps represent early sequential bilingualism rather than simultaneous bilingualism and therefore may not be directly comparable with the simultaneous bilinguals studied in corpora. But even though their English tends to be stronger than their Spanish, they encountered Spanish for the first time early enough that they certainly would not have missed the critical period (during which language acquisition is virtually automatic, cf. **?**). And most compellingly, we saw that that participants' baseline use of adjective-noun in the monolingual task was virtually indistinguishable from the adult monolingual pattern, and so in that respect they behaved like native speakers of Spanish (if native bilingual ones). How comparable one's sample of bilinguals is is always a matter of debate, and there is no 'true' representative of bilingualism (cf. Sebastián-Gallés, Echeverría, and Bosch, 2005).

Primed interference in OT's integration hypothesis

In order to capture interference priming adequately within the OT framework as I have elaborated it throughout this dissertation, a whole additional dissertation-length work would be needed. For while sentence comprehension is a fecund topic of study from an Optimality-Theoretic perspective (e.g. Hendriks, 2014; Hoeks et al., 2011; Stevenson and Smolensky, 2006), the process of comprehending one utterance and subsequently producing another utterance *whose form is influenced by the previous act of comprehension* has to my knowledge not been addressed in these terms. Compounding the existence of this large gap is the fact that we have bilingual data to attend to, not monolingual, and so the issues that I have touched on throughout—language tags, modifications to *Eval*, constraint-splitting—may be operative in this domain as well. Finally there is the issue that I am analyzing *developmental* data, which may involve partial rankings and so have yet another moving part.

Nevertheless, in the relatively small space below I sketch the outlines of an account of interference-priming in the OT manifestation of the integration hypothesis. In the three experimental blocks we saw successively more interference: in the first block, in which no English was spoken, bilingual participants produced virtually all of their Spanish noun modification constructions with a target order; in the second block, in which the experimenter spoke English, the participant Spanish, but the English could not prime the Spanish response, we saw an increase in the rate of unacceptable Adj-N projections, at a rate of about 21%; in the third block, in which the experimenter spoke English, the participant Spanish, and the English stimulus' structure corresponded to the unacceptable order in Spanish, the frequency of unacceptable Adj-N responses in participants' Spanish jumped again, to about 40%. All three blocks should in principle be accommodated to my OT proposal.

As in previous chapters, I introduce the inputs to my optimizations, as well as the candidates that reflect them and the constraints that distinguish among them, but this time I do so by experimental block, since the number of new constraints is small and the identity of the candidates is mostly obvious.

Block 1: Elicitation, Spanish-only context In the first block, participants hear no English, and stimulus utterances (*Dime, ¿qué es esto?* 'Tell me, what is this?') are structurally unrelated to responses (*Una manzana roja* 'a red apple'). Therefore the comprehension optimization that precedes that production one has nothing to do with the target production one.

The input to production is a simple adjectival predicate (e.g., <blue>) that takes a noun to modify (e.g., <car>); the language is specified as well. One constraint needs to be added for the sake of the tableaux reflecting this task and the subsequent; this is *Adj-N, which penalizes the very order that English represents:

(176) *Adjective-Noun Order: *Adj-N

a. *Do not have pre-nominal adjectives.*

b. Satisfied whenever an adjective is not pre-nominal. Violated otherwise.

Such a constraint may seem like a 'brute-force' addition to our set of constraints, but on the contrary, there are several sources of evidence that suggest that a constraint like this one is universally operative (though, of course, could have effects or not, depending on where it settles in the hierarchy of constraints). Typologically, the order adj-N is far less common than its reverse, N-Adj (Greenberg, 1966; Culbertson et al., 2013). Further, some adjectives depend on the noun they modify for their meaning (e.g., '**small** kitten' vs. '**small** bus')—processing the noun first would make interpretation of the adjective more efficient (Hawkins, 1994). A similar account is more directly motivated by semantics, the Head-Primacy Principle urging constructions to have their head appear first and any modifiers later, so that the latter can be interpreted in light of the former (Kamp and Partee, 1995). Alternatively, this empirical generalization may be *syntactically* motivated, e.g. by the cross-linguistic tendency to respect the Final-Over-Final Constraint (FOFC), which adj-N structures do not: "a head-initial category cannot be the immediate structural complement of a head-final category within the same Extended Projection" (Biberauer et al., 2014, p. 169). A theoretically non-committal way of capturing this regularity, then, is to posit the simple constraint *Adj-N, and to leave its genesis unstated.

<blue(x), x=car, lang=SP>	ParseL	ParseT	*LxHdMv$_{EN}$	*Adj-N	*LxHdMv$_{SP}$
a. the blue car	*!			*	
b. the car blue	*!		*		
c. el azul carro				*!	
☞ d. el carro azul					⊛

Table 4.8: Optimization to produce *El carro azul* 'the blue car' in Spanish, no prime

In Tableau 4.8 the *Adj-N constraint is interleaved between the split *LxHdMv constraints, outranking the Spanish-tagged *LxHdMv but not the English. The two *LxHdMv constraints are relevant, and potentially violated by these structures, because it has been argued that the base-generated order of nouns and adjectives is such that the adjective precedes the noun, as in Figure 4.13, where FP is an unspecified functional projection, AP the adjective phrase, and NP the noun phrase.[16]

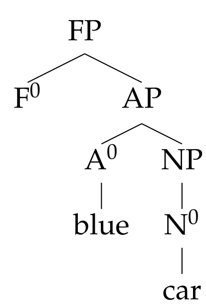


Figure 4.13: Underlying structural representation of English, 'Blue car'

Deriving the Spanish noun-first order requires moving the nominal head up to the head

[16] This series of projections is typically immediately dominated by a determiner phrase (DP), which houses the article/determiner, such as 'a' or 'the', in its head position. The DP is not relevant to these analyses so I exclude it here.

position of the FP, as in Figure 4.14, so that the adjective can appear post-nominally—in an instance of movement of a lexical head, which of course violates *LxHdMv.

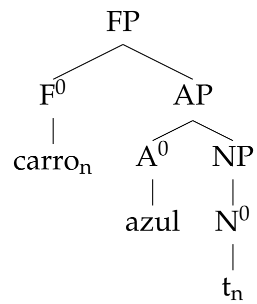


Figure 4.14: Underlying structural representation of Spanish, 'Carro azul' (corresponding to order *Car blue*)

Hence the candidates that raise a Spanish nominal head survive, but the ones that raise an English nominal head do not, which derives our cross-linguistic contrast. Compare the Spanish optimization in Tableau 4.8 to the English optimization below in Tableau 4.9, each with the same constraints ranked in the same order, but with a different language feature in the input.[17]

<blue(x), x=car, lang=EN>	ParseL	ParseT	*LxHdMv$_{EN}$	*Adj-N	*LxHdMv$_{SP}$
☞ a. the blue car				⊛	
b. the car blue			*!		
c. el azul carro	*!			*	
d. el carro azul	*!				*

Table 4.9: Optimization to produce *The blue car* in English

[17]To be clear, at no point did the experiment elicit English data corresponding to this optimization; it is here for comparison's sake only.

Thus when the ParseL constraint rules out non-target-language candidates from further evaluation and then the tagged *LxHdMv constraints are evaluated properly, we can easily derive the target noun modification constructions in both English and Spanish, with the same ranking.

Block 2: English non-prime, bilingual context Moving to the second block, more interference errors begin to be found. To explain these, I propose to introduce the possibility of *failing to apply the full Eval algorithm to the language-tagged constraints*. In particular, because the child had to switch languages—after comprehending an utterance in English she must immediately produce another one in Spanish—*Eval* 'forgets' to run the second piece of the algorithm.[18] This proposal is not unlike the spreading of activation described in the first part of the discussion, based on the Hartsuiker *et al.* (2004) model, in that the activation strength of the Language node of the language just switched to may not be great enough to percolate down to the construction—but may make it through to the relevant lemmas.

The reader may recall from the first presentation of the concept of input tagging that inputs to comprehension take a different form from inputs to production: rather than taking a proposition as an input and a set of surface strings as output candidates, comprehension takes a string of words as an input and *interprets* it, giving the flat string of sounds a propositional structure. Hence, the optimization for comprehension of a sample stim-

[18]The reader may find puzzling the claim that a child's purposely switching language would give rise to a *failure* of the grammar to follow through with an algorithm (1) developed to deal with language-specific instantiations of constraints and (2) whose 'forgotten' procedure is precisely the one that has to do with the language tag itself. Though I have as yet no definitive reply to this intuition, I offer the following speculation: the child herself has no access to the constraints, which are not consciously accesible, and so the fact that *the child decides* to switch languages is irrelevant to *how* the grammar responds to that decision. It so happens that checking language-tags is the *second* step in my proposed algorithm—motivated by independent concerns of processing efficiency, as I discussed in §3.5.1—and in the attempt to suppress the previous language's activations the processor is sufficiently taxed that that second step is overlooked.

ulus item from the second block of the whole experiment—the non-interfering bilingual block—would take the shape of Tableau 4.10.

"that car was blue"	ParseL	ParseT	*LxHdMv$_{EN}$	*Adj-N	*LxHdMv$_{SP}$
☞ a. <blue(x), x=car, tense=PAST, lang=EN>					
b. <blue(x), x=car, tense=PRES, lang=EN>		*!			
c. <blue(x), x=car, tense=PAST, lang=SP>	*!				
d. <blue(x), x=car, tense=PRES, lang=SP>	*!	*			

Table 4.10: Optimization to comprehend 'That car was blue'

The reader may have noticed that only Faithfulness constraints are violated in this comprehension-directed optimization, i.e., they are the only constraints that differentiate the candidates from one another (see the discussion in Legendre et al., 2004). In this type of optimization Markedness constraints are either satisfied or violated by all candidates because Markedness constraints are related to overt structures, movement, etc.—dimensions on which the propositional structures embodied by the candidates will never differ. Therefore the decision of interpretation falls to the Faithfulness constraints, which, I propose, are not involved in discourse-context-based nor priming-derived interference.

When the participant goes to produce a response in Spanish, the optimization becomes a production-directed one, and now the Markedness constraints *may* be decisive. The reader will recall that the procedure for evaluating a candidate against a tagged constraint has two steps: the first is to ask whether a candidate *would violate* an untagged version of the constraint, and the second is to ask whether that candidate's language tag matches the language tag on the constraint.[19] *Eval* still asks whether there is any component of a candidate that violates any tagged constraint, but it does *not* ask whether the language tags are a match between the candidate and the constraint. Thus a violation that is incurred by a *split* constraint with *unmatched* language tags rules out the adult target, leaving the candidate that was interfered with to be produced.

<blue(x), x=car, lang=SP>	ParseL	ParseT	*LxHdMv~~(EN)~~	*Adj-N	*LxHdMv~~(SP)~~
a. the blue car	*!			*	
b. the car blue	*!		*		*
☞ c. el azul carro				⊛	
d. el carro azul			*!		*

Table 4.11: Optimization to produce **El azul carro* 'the blue car'

Since this is a processing issue we are addressing rather than a purely representational one, it will have to suffice to claim that *Eval*'s failure to run the second step of the algorithm to properly assign violations to language-tagged constraints arises stochastically, i.e. does not always arise, leaving the implementation of the process for future research.[20]

[19]More precisely speaking, the second step should read: "Ask whether the tag on the locus of that violation within the candidate matches the language tag on the constraint," in order to be able to accommodate code-switched utterances as well. That is, an utterance whose first half is in English and whose second half is in Spanish needs to have this procedure carried out correctly *per language*, given the many differences between the two languages. Since I do not address code-switching in the current project I maintain the shorthand description given in the body of the text.

[20]The success or failure to carry out both steps of the algorithm may well be conditioned by the cognitive control abilities of the speaker, as discussed in §4.1.3.

Block 3: English interference prime, bilingual context Finally, in the interference-priming block significantly more adj-N productions were observed than in either of the preceding blocks. The analysis of the previous block proposed that one potential source of interference (1) is caused by the switching of language contexts and (2) is manifested in the failure to apply the *language* portion of a rule. Because the interference-priming block contained a shift in language context *plus* the prime of the unacceptable utterance, there should be two possible sources of interference in the way that productions are generated in this block.

In the optimization for comprehension of the interference prime (Tableau 4.12, no modifications to the optimization procedure itself are needed. As Legendre et al. (2004) discuss, the inputs to comprehension are less susceptible to the sorts of errors that the child ranking can give rise to in production, because the candidates in comprehension optimizations are uniform in their violations of MARKEDNESS constraints. The child has no trouble parsing the simple noun modification phrase, 'The blue car':

"It was a blue car"	PARSEL	PARSET	*LXHDMV$_{EN}$	*ADJ-N	*LXHDMV$_{SP}$
☞ a. <blue(x), x=car, tense=PAST, lang=EN>				⊛	
b. <blue(x), x=car, tense=PRES, lang=EN>		*!		*	
c. <blue(x), x=car, tense=PAST, lang=SP>	*!			*	
d. <blue(x), x=car, tense=PRES, lang=SP>	*!	*		*	

Table 4.12: Optimization to comprehend 'The blue car'

But after comprehending that utterance, her grammar faces a choice: it can learn from the optimization it just produced, perhaps reranking the constraint that was violated by the winner—clearly the *Adj-N constraint was not decisive here, so, the grammar might consider, it may need to be demoted. In addition, it has to 'resettle' so that the language-tag-checking algorithm can be carried out accurately. This is a lot of pressure to put on a 4-year-old processor. In the context of an experiment—already with an unfamiliar person who suddenly showed up in their school one day, speaking only Spanish with the child until halfway through the experiment—it might be difficult to get the grammar to optimize an input correctly. Instead of the target optimization that Tableau 4.8 represents, the grammar might look like Tableau 4.13 while generating the child's response.

<blue(x), x=car, lang=SP>	ParseL	ParseT	*LxHdMv~~(EN)~~	*Adj-N	*LxHdMv~~(SP)~~
a. the blue car	*!			(*)	
b. the car blue	*!				
☞ c. el azul carro				(⊛)	
d. el carro azul			*!		*

Table 4.13: Optimization to produce **El azul carro* 'the blue car'

In Tableau 4.13 I have made yet another addition to the traditional notation: just as on p. 302, I have placed the language tags (in parentheses) to indicate that they may or may not play a role in the evaluation of the candidates against that constraint; and now, in the *Adj-N constraint's column, I have placed *its violations* in parentheses as well. This is because I would like to claim that rather than demoting a constraint like *Adj-N on the basis of a few sequential acts of comprehension whose inputs violate it, a bilingual child may *temporarily* *ignore* violations of constraints *that were violated by but not fatal to the winner in the previous optimization.* In other words, the Markedness constraint *Adj-N was violated *by the winner* of the previous optimization for comprehension, and its violations are overlooked/ignored in the subsequent optimization to production.

Therefore, not only do we see an effect of immediately-preceding language context thwarting the application of the evaluation procedure for language-tagged constraints, but *Eval* is also overlooking a constraint that was violated in the immediately-preceding optimization, so now there are *two* sources of 'errors', which would give rise to the prediction that we would see more errors themselves (as we do)—either optional error alone would yield candidate (d).

The advantage to proposing these two sources of interference is that, for a given child, it is possible for only one of them to be operative, which would allow us to capture different response patterns across individuals. If, for example, a child did not respond 'negatively' to the need to constantly switch back and forth between languages—did not produce interference in Block 2, the first bilingual block—but did produce interference in Block 3, with the interference primes, then we would assume that it is the second route of interference that causes non-target utterances to emerge from her grammar (the one that temporarily ignores constraints violated by the previous winner). If another child were not susceptible to interference primes but did produce more adj-N in the bilingual blocks than in the monolingual one, the first route of interference would have driven her behavior.

If we look at the patterns of adj-N use by individuals in the experiment (Figure 4.15, we see the first prediction confirmed in several participants' data (at least using visual inspection as a metric for comparison): participants 3, 4, 7, 9, 10, 12, 13, and 14 show much more use of adj-N in Block three, the interference-priming block, than in the other two. The second prediction is also apparently confirmed in the data of a number of participants: participants 1, 5, 6, 8, and 11 seem to produce approximately equivalent proportions of adj-N utterances in the non-priming bilingual Block 2 and the interference-priming bilingual Block 3.

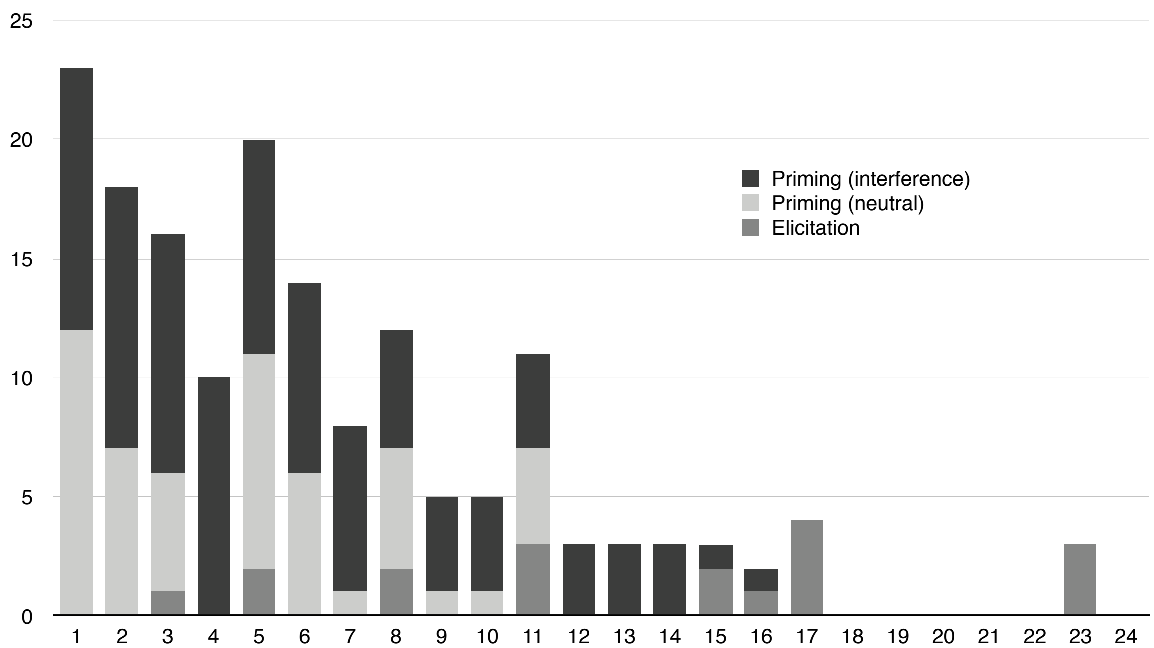


Figure 4.15: Percent **adj-N** responses in the interference-priming study, by participant

We thus have some preliminary evidence that on a case-by-case basis the two routes of interference may come apart, suggesting that this could be an important part of the account and one worth pursuing further.

A word of caution Both of the routes that I have proposed to account for cross-linguistic interference motivated by language context or by priming are nothing if not unorthodox—in contrast to the rest of my proposed additions to the OT framework, which draw on established characterizations of the system. Nevertheless, I expect that both proposals hold some promise, for reasons that I briefly lay out before closing the chapter.

The notion of failing to carry out the portion of the evaluation algorithm that checks a constraint's language tag against a candidate's seems like a fair one to underlie interference of various sorts, because it *localizes* the effect. It is not as if we are turning off the PARSEL language-parsing constraint, which would lead to catastrophic effects, speakers using the wrong language at the wrong time in the course of a regular conversation in which interlocutors' structures were related in some way. Instead, if for instance a bilingual speaker participates in a code-switching conversation involving her first and second languages, she may find that she produces more non-target constructions than she would in a monolingual conversation—a possibility with which the bilingual readers of this project will likely have had some first-hand experience.

There are two protections against rampant interference resulting from this source: one is that I have already claimed that it is by no means *necessary* that the second part of the algorithm be ignored; it is simply a possibility available to the grammar and specifically to *Eval*, if processing pressures are too great to carry out to a T every aspect of the computation. The other protection is that in many cases constraints do not need to split: in adult grammars, many FAITHFULNESS constraints will uniformly outrank many MARKEDNESS constraints, and in the same way for each language. Therefore there could be times when

Eval did fail to check for matching language tags, yet this failure had no effect on production, because all of the constraints that were decisive for that optimization had the same violation profiles across viable candidates.

Failing to check language tags is a proposal unique to multilingualism (although the idea could be extended to multilectalism, multiple registers, etc.). But the other mechanism that I have proposed to underlie interference—ignoring violations of constraints that were violated by but (by definition) not fatal to the winning candidate of the previous optimization—is more general and therefore should be viewed more warily. Nonetheless, this proposal, too, has some appeal that this dissertation cannot explore in detail but may be helpful in further extending OT into the territory of sentence processing.

The reader may have noticed that it is a MARKEDNESS constraint, *ADJ-N, that was violated by the winner in Tableau 4.12 and ignored in the subsequent optimization in Tableau 4.13. And it was violated in a *priming* context—an idea that has a clear affinity with perhaps the best-accepted generalization about structural priming: more marked structures prime, less marked structures do not (as often). When experimenters present, e.g., the passive/active alternation to participants in priming studies, hearing a passive is likelier to cause production of another passive than active-to-active priming arising (Ferreira and Bock, 2006). Why would this be? Individuals already *expect* to hear the less marked, more frequent utterance types, and so hearing these types in an experiment does not surprise participants, nor cause them to adjust their expectations or their production patterns.

Similarly, hearing (English) adj-N constructions over and over while trying to produce target-like N-Adj constructions in Spanish could also surprise the grammar. The effect of priming *in general*, both in the interference case and in the traditional, grammatical priming case, on an OT system may well be to temporarily overlook Markedness violations, for the following reason: the alternations usually tested in priming experiments are designed to be semantically identical (although they will differ along information-structural dimensions). Given the same semantics of an input to production, a deterministic grammar such as traditional OT grammars represent will always produce the same output; given the same string as an input to production will always produce the same interpretation. As a consequence, in order to produce the requisite optionality *that is partially determined by preceding optimizations*, there has to be some flexibility *either* in the way that constraints are evaluated *or* in the way that violations are incorporated into the final optimization (or both). This requirement pits the current proposal against the many fruitful accounts of optionality in OT that make use of, e.g., bidirectional architectures (Bouma, 2011). Those studies aim to account for *true* optionality, of which, arguably, priming is not an instance, given the reliable but probabilistic effect that an act of comprehension has on the subsequent act of production.

By overlooking violations of previously non-fatal constraints for production, we can effectively coerce the grammar into embodying the idea, "I don't usually like utterances with X feature—but that string I just heard in my primary linguistic data displayed X feature, so maybe it's okay." Further exposure to more primary linguistic data, or a simple resetting of the system to its baseline 'knowledge' state, could erase the effects of priming, explaining why there *are* long-term structural priming effects, but only under certain circumstances.

In attempting to conceive of an alternative to the proposal of overlooking violations, it is difficult not to fall back on it each time. One alternative takes off from the idea that it is the information-structural features present in an input to comprehension that cause priming to arise: if an input to comprehension is, e.g., patient-prominent (or patient-focused, etc.), then in order to be maximally faithful to the previously-heard utterance, the subsequent production will also be patient-prominent. But as usual, satisfying such a FAITHFULNESS constraint would entail violating a MARKEDNESS constraint—and presumably one that is ranked higher than the relevant FAITHFULNESS constraint, lest the proposed more-marked, patient-prominent utterance be less bad with respect to a decisive MARKEDNESS. This would be a counterintuitive outcome to be sure.

Thus while I have extended the OT framework in unfamiliar directions for processing purposes, it appears that it is capable both of handling these bilingual-specific phenomena and of making some preliminary hypotheses about how certain processing phenomena may be realized in such a framework.

4.4 Conclusion

In this chapter I have extended the OT framework for an integrated bilingual grammatical architecture once again, now to explain the flip-side of the facilitation phenomenon: cross-linguistic interference. We saw that the same English *wh*-questions that were facilitated in the development of simultaneous Spanish-English bilinguals posed some problems for early sequential bilinguals—but they were problems that were directly drawn from those children's Spanish grammar. More challengingly, cross-linguistic interference in the domain of noun modification was explored in some depth, placing children in several comprehension/production contexts that appeared to alter the way that their grammars generated productions. Both of these findings, in addition to the others reviewed earlier in the chapter, are a clear complement to the facilitation results that were explored in Chapters 2 and 3 in their support of the integration hypothesis.

In the next, concluding chapter, I review the lessons of the dissertation and suggest some extensions of the model that should be pursued in future work.

Appendices

A: Experimental stimuli

Stimulus noun	Stimulus adjective	Target adjective	*(Spanish)*
backpack	black	golden	*dorada*
ball	dirty	clean	*limpia*
balloon	golden	purple	*morado*
bear	healthy	sick	*enfermo*
bed	red	grey	*gris*
bicycle	little	big	*grande*
bird	huge	tiny	*chiquito*
boot	short	tall	*alta*
cake	orange	green	*verde*
car	old	new	*nuevo*
cat	skinny	fat	*gordo*
chair	hard	soft	*suave*
coat	blue	orange	*anaranjada*
cup	grey	blue	*azul*
dog	sleepy	awake	*despierto*
flower	green	pink	*rosada*
guitar	pink	yellow	*amarilla*
hat	yellow	white	*blanco*
house	tall	short	*baja*
pencil	long	short	*corto*
rabbit	yellow	brown	*marrón*
shirt	polka-dot	striped	*rayada*
table	white	black	*negra*
truck	purple	red	*rojo*

B: Elicitation stimuli

Noun (Span.)	**(Eng.)**	***Stim. Adj.***	**(Eng.)**	***Target Adj.***	**(Eng.)**
avión	airplane	*limpio*	clean	*sucio*	dirty
caballo	horse	*blanco*	white	*coloreado*	colorful
café	coffee	*frío*	cold	*caliente*	hot
canasta	basket	*vacía*	empty	*llena*	full
dinosaurio	dinosaur	*alto*	tall	*bajo*	short
elefante	elephant	*triste*	sad	*feliz*	happy
flor	flower	*seca*	dry	*mojada*	wet
gato	cat	*dormido*	asleep	*despierto*	awake
hipopótamo	hippopotamus	*pequeño*	small	*grande*	big
libro	book	*cerrado*	closed	*abierto*	open
mariposa	butterfly	*amarilla*	yellow	*azul*	blue
niño	boy	*simpático*	friendly	*enojado*	angry
niña	girl	*sana*	healthy	*enferma*	ill
pájaro	bird	*guapo*	handsome	*feo*	ugly
pato	duck	*contento*	content	*triste*	sad
perro	dog	*negro*	black	*rojo*	red
pimiento	pepper	*anaranjado*	orange	*amarillo*	yellow
pingüino	penguin	*rosado*	pink	*negro*	black
tortuga	turtle	*verde*	green	*morada*	purple
vaso	cup	*entero*	whole	*roto*	broken

Chapter 5

Conclusion

5.1 Cross-linguistic influences in bilingual acquisition

This dissertation provides evidence for several kinds of cross-linguistic influences in bilingual acquisition and, in analyzing the phenomena in an Optimality-Theoretic framework, shows how an integrated architecture can explain those phenomena as arising from a grammar that does not fundamentally differ from a monolingual grammar. The empirical focus of the dissertation is on Spanish-English bilingualism, in which three types of constructions are studied: in Chapter 2, predicative sentences involving BE verbs; in Chapter 3, *wh*-questions; and in Chapter 4, noun modification.

Taking the traditional characterization of an OT grammar as a point of departure, each analyzed construction introduces a new challenge to the architecture. Predicative sentences with BE have the same underlying representation in both Spanish and English (Chapter 2), and so have been captured using the same constraints and ranking for both languages, with the minor addition of language tags in the input in order to determine the language of production. The shared ranking coupled with language-specific features of Spanish BE explains the facilitation that has been observed in simultaneous bilinguals. Two sources of evidence for the very TENSE feature that monolingual English-speaking children are slower to master are supplied by Spanish: the transparency of the mapping from BE verbs into semantic functions (individual-level and stage-level predication), which increases the salience of tense and aspect, and the rich tense/agreement verbal morphology, which cues the contrasts between temporal features and persons.

In the case of *wh*-questions (Chapter 3), we have seen that a pair of operative constraints, one penalizing lexical head movement (*LxHdMv) and the other penalizing extraneous overt material in output candidates (Fill), do not occupy the same position in English and in Spanish, hence those constraints must be split and tagged for language. Both facilitation and interference have been documented in the domain of *wh*-questions: in simultaneous acquisition, apart from the occasional cross-linguistically motivated error, Spanish-English bilingual children exhibit significantly less non-target optionality in their production of *wh*-questions than do their monolingual counterparts. In early sequential bilingualism the results are more mixed, based on our experimental study (Chapter 4)—children producing a high percentage of auxiliaries relative to the amount of English input they receive, but producing non-inverted auxiliaries more often than comparable monolinguals. We attribute the latter interference to the *variety* of Spanish that some participants have learned, in which some but not all *wh*-question types are not inverted; it is these very types that in English are less often inverted as well.

Noun modification constructions (noun + adjective: Chapter 4) have reverse orders across the two languages of interest, and I have shown that early sequential bilingual children can be primed to produce noun modification with the English word order *in Spanish*, in spite of the fact that corpus data do not provide evidence of such interference in this domain. That experiment is the first to have attempted to prime cross-linguistic interference, and it raises an additional challenge for the architecture. Not only does the split *Lx-HdMv constraint have a role to play here, but because of real-time experimental influences, it is necessary to invoke points of vulnerability in the grammar's evaluation algorithm and propose multiple routes of interference.

5.1.1 Avoiding optionality

A theme that has run through this dissertation is the optionality of forms characteristic of (particularly English) monolingual child language, which is conspicuously minimized in bilingual acquisition. There are several important insights to be drawn from this.

The first is that OT has made it plain how the optionality of ungrammatical omissions can be mostly avoided in certain constructions and in certain instances of bilingualism. Optimality-Theoretic accounts of language acquisition are uniquely suited to explaining developmental optionality because of the way in which rankings are learned, such that multiple rankings can be entertained at once (via partial ranking); for any given production the system may output *any* of the options represented by the partially ranked grammar. Such partial rankings are not typically thought of as constitutive of adult grammars, hence it is necessary to abandon this state of affairs in order to reach the adult state. Having two sources of input regarding effectively the same generalization to be learned—that the Parse family of Faithfulness constraints outrank Economy of Structure constraints—is a boon to the bilingual children studied here, whose English can be bootstrapped onto their Spanish to become target-like earlier.

Yet being bilingual also introduces more sources of potential optionality than monolingualism does, at least under the assumption of an integrated architecture. Complementarily to the diminished optionality that facilitation represents, we have also seen that cross-linguistically motivated errors, which I call *interference*, arise in experimental contexts (as well as in spontaneous-production contexts, although less frequently). Cross-linguistic interference, just like errors of omission in monolingualism, does not emerge constantly or even deterministically, and is instead subject to a variety of influences including the production context and the degree of the speaker's language dominance.

Interference differs from the optionality usually found in monolingualism because it represents errors of *comission* rather than of *omission*, but as I have shown in my analyses, the source of each kind of optionality is one and the same: Markedness constraints float around Faithfulness constraints, sometimes giving rise to target-like utterances and other times giving rise to utterances that differ in only one—but one important—relative ranking and corresponding violation. Again evidence from production supports the hypothesis that bilingual grammatical architecture is not fundamentally different from monolingual grammatical architecture, and that the knowledge pertaining to both languages is represented within a single grammar parallel to a monolingual's.

5.1.2 Features of the formalism

Developing a formal account of bilingual grammatical architecture, and within that of cross-linguistic influences, has a number of advantages relative to previous theories on this topic. A first benefit is its explicitness: all constraints believed to be involved in the generation *of a structure* are placed directly into the model, which may generate different/ more accurate predictions than the more common strategy of mentioning/listing only the criteria relevant *to the analysis*. For example, the prediction that English *wh*-questions could show both interference *and* facilitation, in spite of a lack of structural overlap with Spanish, is generated only because of the relationships between constraint violations, in addition to the impossibility of maintaining the same ranking to give rise to different winners. The need for constraint demotion and constraint splitting suggests that interference should be possible in this domain—a prediction likely not made if the generation of utterances is viewed differently.

My OT account of bilingual grammatical architecture is also advantageous because it is eminently responsible to accepted linguistic theory. While there are many advantages to thinking about cross-linguistic influences in an abstractly computational way, along the lines of the Hartsuiker et al. (2004) model that I have addressed several times throughout, such psycholinguistic models tend to gloss over what the non-surface-level representations are that are involved in sentence generation. In existing models of, e.g., cross-linguistic influence in noun modification, as observed in (grammatical) priming studies with bilingual adults, there are no movement operations of which to speak, which means that the relationships between the two Spanish ordering options to the single English ordering option do not respond to accepted theoretical accounts. Because OT is an architectural rather than a substantive theory, it can embody whatever conception of linguistic knowledge is most compelling—and at this moment in time, that conception is still movement-based.

A third benefit to the way that I have chosen to formalize the integration hypothesis is that we are now possessed of a picture of bilingual grammatical architecture that is flexible yet constrained. It is flexible in that it can in principle capture any kind of cross-linguistic structural influence—yet it is constrained by the initial state of the grammar, in which ECONOMY constraints outrank FAITHFULNESS constraints. And perhaps more crucially, the system is constrained by the developmental steps that have been proposed: constraints can be reranked via a constraint-demotion or other learning algorithm, and they can be split and tagged per language, after which each newly split-and-tagged constraint can be reranked again on its own terms. But there is no 'turning back', no reintegrating split constraints—and there are no changes in rankings that are not motivated by the child's producing/comprehending new utterances and comparing them with her primary linguistic data. As a result, the predictions that follow from cross-linguistically motivated reranking are reasonably specific and not overgenerated.

5.2 Extensions in future research

Because this is the first exploration of bilingual grammatical architecture in OT, there are many lines of future research that extend outward from the account. The first task is to broaden its scope of application to other constructions and other language pairs. In particular it would be helpful to learn how the languages analyzed here influenced other languages, e.g., if English were paired with French or Spanish with Japanese. The predicted outcomes of these pairings can be generated on the basis of the formalism alone, but in order to verify individuals' grammars we will need to seek more empirical evidence.

In addition, the proposals that I have offered for the processing phenomena documented in the noun modification experiment are only in their infancy and bear much more study. While OT is in principle very amenable to accounting for processing, this first foray into an explanation of (cross-linguistic) priming has raised a number of issues for the architecture at large: how is real-time optionality manifested in an OT grammar?, how are the influences from comprehension to production best represented?, and how does the grammar return to its baseline state after priming has occurred? To answer these questions we might look to computational implementations of the grammar as I have described it here, developing specific predictions for the alternatives as to where the locus of priming resides in such a grammar. Experimental studies with bilinguals will be particularly informative as to influences of the communicative context on productions, but the effects of structural priming proper could be investigated in monolinguals just as well as in bilinguals.

A final extension concerns the nature of the language feature that I have proposed to reside in the propositional input to a bilinguals' optimizations for production. Yet as discussed when this proposal was first presented in Chapter 2, speakers seem to have a relationship to their choice of a language for a particular utterance that is different from their relationship to choosing whether to use an active or a passive construction. Perhaps this difference is merely qualitative—a speaker *can* consciously choose active vs. passive just as readily as she can consciously choose Spanish vs. English, but she exercises that choice more often in the latter case than in the former—but it might also represent a difference in kind. If there were such a difference, it would perhaps explain some of the other cognitive outcomes for bilinguals that distinguish them from monolinguals. But this then re-raises the question of how the language feature should be represented in the grammar (or in the mind). This question should be explored both experimentally and with further development of the formal model (possibly extended into a computational model as well). Because it deals with conscious and unconscious factors it suggests that an often neglected aspect of language processing, that of a speaker's communicative goals, may be receptive to a fresh look.

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Vita

Lisa Hsin was born in Hollywood in 1985 and spent her youth in south Florida. She attended Georgetown University for her undergraduate studies, where she specialized in languages and linguistics. After graduating in 2007, Lisa taught K-12 Spanish in Northern Virginia and in Baltimore County, until she entered the Ph.D. program in Cognitive Science at Johns Hopkins. In addition to completing coursework and conducting research at Johns Hopkins she served as Coordinator of the Language Acquisition Lab. Lisa began her postdoctoral career in the Center for Cognitive Studies at Tufts University in the fall of 2014, where her research continues to focus on language acquisition and use, bilingualism, and learning.